AUGUST, 1961

Plant Engineering®

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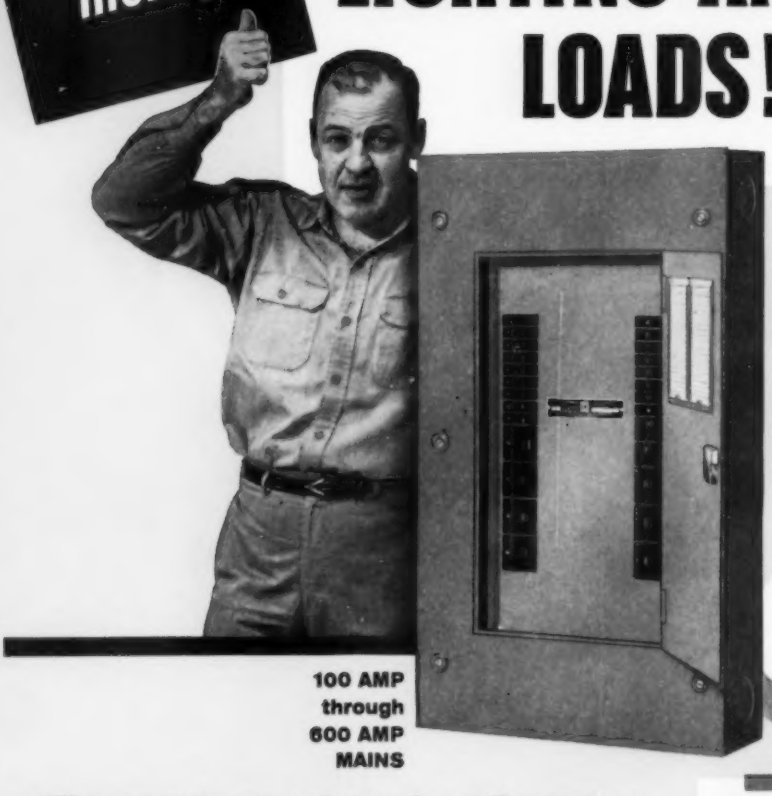
The magazine that helps **plant** engineers with their everyday problems

Volume 15, No. 8 Circulation of this issue 52,190

SAVE- space time money

Same PANELBOARD COMBINES *Both* LIGHTING AND POWER LOADS!



100 AMP through 600 AMP MAINS

NQO Panelboard

Heavy Duty Construction!

• Why waste time, space and money by installing separate lighting and power panelboards? Square D now makes it easy to combine 120 and 240 volt lighting and power loads up to 100 amperes, into one panel. Equally important, thanks to plug-in design and a complete range of circuit breakers (*at right*), you can get a real heavy duty industrial type panelboard with exactly the circuits you need—right out of your Square D distributor's stock*... ***Write for the complete story. Address Square D Company, 1601 Mercer Road, Lexington, Kentucky***

*NQO (plug-in) and NQOB (bolted connection) panelboards are also available factory-assembled for shipment direct to the job

FINEST BREAKER EVER BUILT!

THE QO FAMILY

QO 1-POLE 15-50 Amp | QO 2-POLE 15-70 Amp | QO 3-POLE 15-60 Amp | QI 2-POLE 70-100 Amp | QI 3-POLE 70-100 Amp

SQUARE D COMPANY

wherever electricity is distributed and controlled

Circle 501 on postcard, page 33

BEST BUY
IN THE COMPACT FIELD TODAY

NEW WATTS
FILTER – REGULATOR – LUBRICATOR

You know what it's like to design a system and then find oversized components driving weight and costs up.

But no more. Now you can specify this compact Watts assembly for applications where (1) space is limited or (2) you have low flow requirements.

You don't sacrifice a thing! Dependable Watts filter has 20 micron porous bronze element. Exclusive Watts by-pass principle gives optimum lubrication at flow rates from .2 to 15 CFM with negligible pressure drop. Fill plug and oil feed adjustment are interchangeable front to rear. Maximum pressure is 150 PSI. Two sizes — ⅛" and ¼".

Write for complete information. Watts Regulator Company, Industrial Division, Lawrence, Massachusetts

Circle 502 on postcard, page 33

Plant Engineering August 1961, Volume 15, No. 8

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Editorial Director

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'ROUND ABOUT with the editors

Edited by R. L. Marinello

Visit Us at Booth 1218—Industrial Building Exposition

IF YOU ARE attending the Industrial Building Exposition and Congress, be sure to visit us at Booth 1218. The dates and place are: September 25 through 28, at the New York Coliseum.

Many of the editors will be on hand to greet you and answer any questions you may have. Or maybe you will just want to sit and relax after that hour-r-r-r long tour of the exhibits. In any case, we'll be happy to have you visit with us.

Further information about the conference program which will be held on the first three days—September 25, 26 and 27—appears on page 113.

Certificate of Appreciation

PLANT ENGINEERING was pleased to receive a certificate, shown below, from Mr. S. A. Anthony, Jr., President, The National Institute for Disaster Mobilization, Inc., for services rendered during their recent seminar held in Houston, Texas.

The National Institute for Disaster Mobilization, Inc.
Expresses its appreciation to
PLANT ENGINEERING MAGAZINE
for an outstanding contribution
to the success of
The Fifth Annual
Industrial Mutual Aid &
Disaster Control Seminar

We are happy to have played a small part in the success of this year's Industrial Mutual Aid and Disaster Control Seminar.

Plant Engineering—on Microfilm

MICROFILM PRINTS of the 1960 issues of PLANT ENGINEERING, Volume 14, are now available for distribution to industrial plant libraries and public libraries. The price for Volume 14 is $11.95, plus postage.

This volume or any of the previous volumes of PLANT ENGINEERING can be obtained from University Microfilms, Ann Arbor, Michigan.

Please note that distribution of these microfilms is limited to firms and individuals on our controlled and subscription lists.

England To Hold First Maintenance Conference

THE FIRST four-day maintenance conference ever to be organized in Europe is being held this year at The Central Hall, Westminster, London, England, from November 13 to the 16. It is being organized by the English publication *Plant and Factory Maintenance.*

Here is a brief review of some of the talks which will be presented during the four-day conference: Measuring maintenance efficiency; Maintenance problems in small, medium and large plants; Incentives for maintenance personnel; Maintenance cost control; The role of contractors in maintenance; Safety of portable tools; Welding advances adapted to maintenance; and many more.

For further information about the program or registration and hotel accommodations, address your inquiry to the Conference Organizer, National Maintenance Conference and Exhibition, 109-119 Waterloo Road, London, S.E.1, England.

Materials Handling Course

THOSE TEACHING or planning to present a course in materials handling or industrial packaging will be interested in the new, comprehensive outline which is now available.

The 166-page outline is composed of 20 separate units or sessions. Some of the topics include warehousing, outdoor handling and storage, analysis of handling problems, packaging, selection of equipment, industrial trucks, and effect of handling on layout.

Also included is a list of aids required; a listing of effective films; free materials for classroom distribution; complete reference list of textbooks, handbooks and publications; a master list of visual aids; and a complete bibliography.

Readers interested in getting more

Subscriptions: U.S.A. $10. Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by the 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Milwaukee, Wis.

BPA NBP

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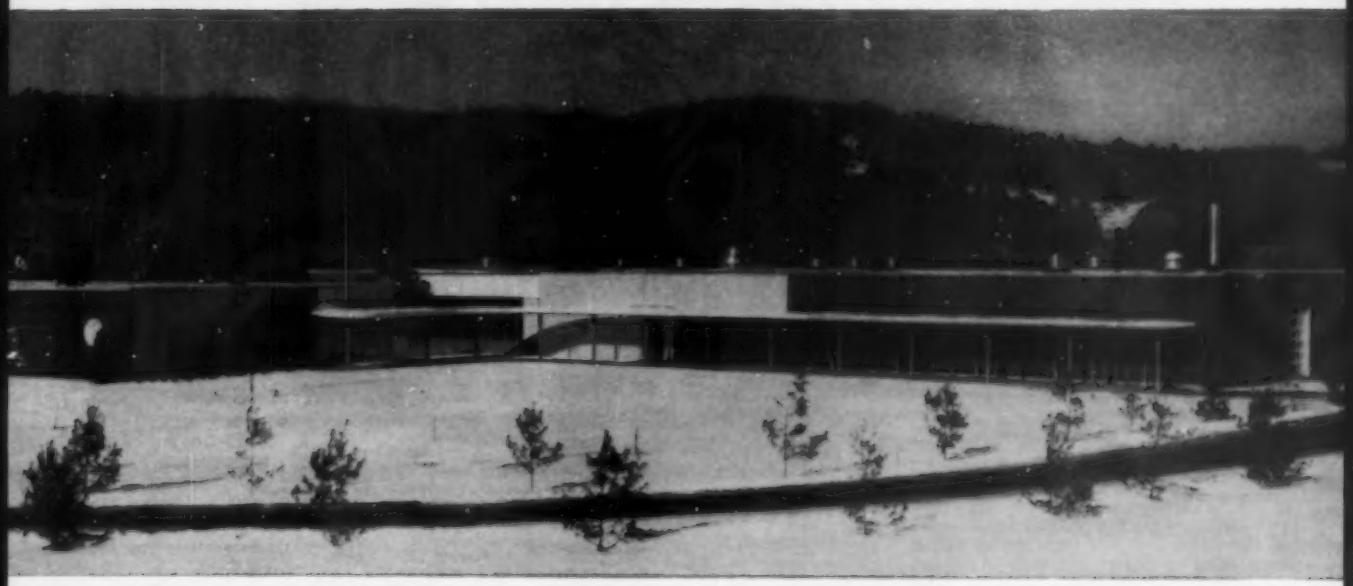
Former "Top Ten" industrial plant features Natco Glazed Velour Brick

Appearance of building and grounds was one of the important selecting factors in the "top ten" competition.



Decorative and durable Natco black velour brick gives the Split Ballbearing plant in Lebanon, N.H., distinctive design. This plant (Division of Miniature Precision Bearings, Inc.) was designed by Carl Koelb & Associates, Architect, Weston, Mass.

The Split Ballbearing plant in Lebanon, New Hampshire, was named one of the country's "top ten" industrial plants by Factory Magazine the year it was completed. Selection of the ten award-winning plants—from a field of 700 entrants—was based on their architectural beauty *and* their functional qualities.

One of the influencing factors in the judging was the appearance of the plant exterior. Natco Ceramic Glazed Velour Brick was used on the outside wall construction. Versatile black velour brick serves a dual purpose. First, it is distinct in design . . . modern now and in the future. Second, it is durable . . . will help solve outside maintenance problems.

Ceramic Glazed Velour Brick is furnished in nine attractive colors, plus black and white. It is available in standard brick sizes and conforms to ASTM specifications. For more information, write for Circular CB-30.

Beauty and utility . . . Natco velour brick has them both

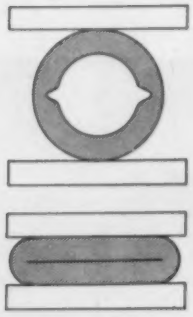
natco corporation

GENERAL OFFICES: 327 Fifth Avenue, Pittsburgh 22, Pennsylvania . . . Branch Offices: Boston • Chicago • Detroit • Houston • New York • Philadelphia • Pittsburgh • Syracuse Birmingham, Alabama • Brazil, Indiana...IN CANADA: Natco Clay Products Limited, Toronto

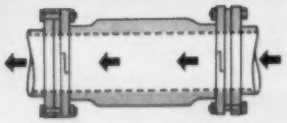
Circle 503 on postcard, page 33

Massco-Grigsby PINCH VALVES

"Hinged" sleeve permits tight closing reduces wear.

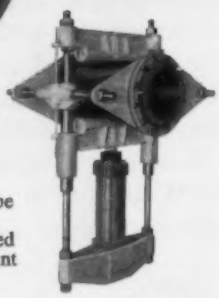


Recesses in sleeve serve as "hinges" during compression.



Unobstructed flow eliminates high friction loss; and there are no metal parts in contact with pulp or liquid.

Several types of closing mechanisms are available, from handwheel to motorized.



Automated Systems.
Completely automatic systems may be coordinated and interlocked with other plant equipment.

1" to 14" I.D.; pressures to 150 psi; temperatures to 200° F.

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OFFICES AND AGENTS IN PRINCIPAL CITIES

Circle 504 on postcard, page 33

'ROUND ABOUT

information about this outline or how they can purchase it, should send their request to The Material Handling Institute, Inc., One Gateway Center, Pittsburgh 22, Pa.

Directory on Plastics

RESULTS OF A recent survey of all Army, Navy and Air Force research and development work in plastics are compiled in this directory.

Names of engineers engaged in developing or manufacturing (or both) the plastics items listed; the names, addresses and telephone numbers of the installations; and telephone extensions of individuals are included.

The booklet, Technical Resources Directory in Plastics (PB 171 036) is available from the Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. Price is $2.75.

Military Service Manpower Analysis

HOW DOES your staff of engineers and technicians rate in relation to the Universal Military Training and Service Act? To help you make a quick analysis of the probable liability of your male employees, especially those having critical occupations, various forms and instructions are available to you.

An appendix to the material sets forth the current list of Critical Occupations as issued by the U. S. Department of Labor and the current list of Essential Activities issued by the U. S. Department of Commerce.

For the complete pamphlet, containing an introduction, the various forms necessary and the appendix, send your request to the Engineering Manpower Commission of Engineers Joint Council, 29 West 39th St., New York, N. Y. or the Scientific Manpower Commission, 1507 M Street, N.W., Washington, D. C.

Engineering Changes at Armco

Ora E. Clark, general superintendent of the Middletown Works of Armco Steel Corporation, is retiring after 34 years' service with the company.

Donald C. Osborne, presently assistant general superintendent of maintenance and services, succeeds Clark.

John J. Timberlake will become assistant general superintendent of maintenance and services. He formerly held the position of superintendent of assigned maintenance.

James G. Townsley, now assistant superintendent of assigned maintenance, will be promoted to superintendent of assigned maintenance.

Mr. Clark joined the company in 1927 as blast furnace superintendent. In

O. E. Clark

D. C. Osborne

J. J. Timberlake

J. G. Townsley

1947 he became assistant general superintendent of the Hamilton, Ohio, plant and general superintendent the following year. In 1951 he was made general superintendent of blast furnace operations at the Middletown Works, and in 1956 was promoted to general superintendent of the plant.

Mr. Osborne is a graduate of Purdue University and joined Armco in 1933. In 1941 he was named assistant to the superintendent of cold strip processing and in 1946, superintendent. He was promoted to assistant to general superintendent in 1956, and in 1957 became assistant general superintendent of rolling and processing.

Mr. Timberlake, a graduate of Linsley Institute, joined the company in 1935. After serving as an electrical engineer, he was named general foreman in the maintenance department in 1944. He was promoted to assistant superintendent of the maintenance department in 1948, and superintendent of assigned maintenance in 1959.

Mr. Townsley is a graduate of the U.S. Naval Academy. He started with the company in 1947 and after several special assignments was named assistant foreman in assigned maintenance in 1950. He advanced to assistant superintendent of assigned maintenance earlier this year.

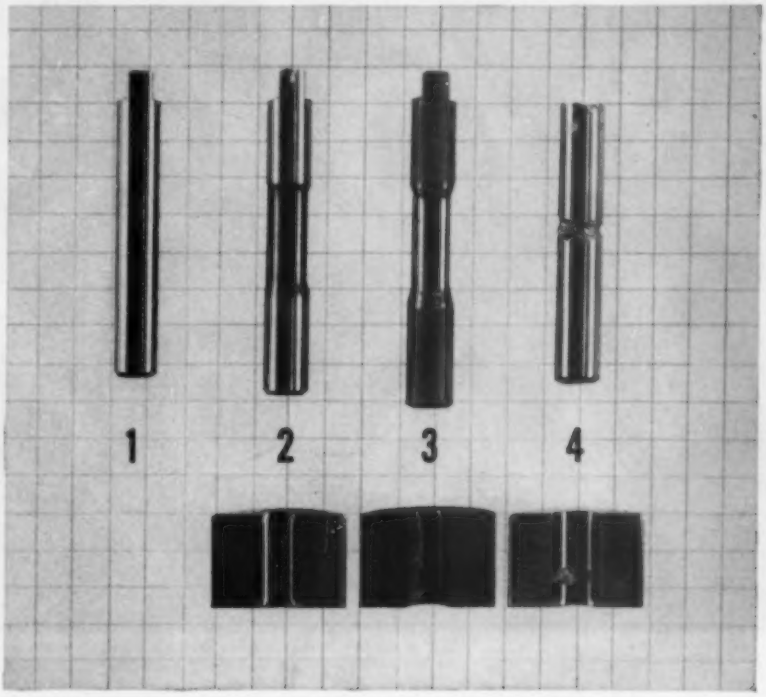
CLIMAX MOLYBDENUM

Molysulfide® News Digest

CLIMAX MOLYBDENUM COMPANY, a division of American Metal Climax, Inc., 1270 Avenue of the Americas, New York 20, N.Y.

RECENT TEST SHOWS MORE PROOF OF MoS_2's LOAD-CARRYING ABILITY

From the German laboratory of Alpha Molykote Corporation comes new proof of Molysulfide's® ability to resist galling and seizing at pressures beyond the yield point of most metals. Previous tests have shown that MoS_2 sustains loads up to 475,000 psi. In this Almen Wieland test, similar to the Falex test, a ¼" pin actually extruded *without any surface damage* at pressures of 100,000 psi, while similar pins using other lubricants were torn, galled or "frozen" to the point of breakage.



The photo above shows mild steel pins used in Almen Wieland test. No. 1 is unused Control Pin. No. 2 (lubricated with mineral oil and MoS_2) and No. 3 (with MoS_2 bonded coating) were elongated and extruded without weight loss. No. 4 shows typical failure with conventional lubricant. Note that the key sheared off and that pin and block were galled and seized. Surveys of many laboratories indicate that the extrusion phenomenon exhibited by No. 2 and No. 3 pins has never been produced with any other conventional lubricant.

As a result of Molysulfide's unique pressure-sustaining ability, MoS_2 is widely used as a "break-in" lubricant which prevents abrasion and seizing, permits shorter "break-in" runs, and prevents bearing damage when boundary lubrication occurs.

When writing, refer to CL-107

New Teflon-MoS_2 Bearing Component Withstands Temperatures Up To 575°F

A new precision ball bearing, which operates at temperatures up to 575°F and needs no conventional lubrication, is now coming off the lines at the Barden Corporation's plant in Danbury, Conn. Trade-named BAR-TEMP, the new bearing utilizes a ball retainer of reinforced Teflon compounded with "Moly" lubricant. Resistance to deformation is much higher than that of pure Teflon*. Also, the material serves as a *dry lubricant*. As the bearing rotates, microscopic amounts of Molysulfide rub off and are deposited on the raceways. Result: long bearing life at temperatures where conventional lubricants fail.

Successful applications include synchros, fans, motors, blowers, barometic pressure switches, tachometer generators, and other devices operating from 1,000 to 24,000 rpm, at temperatures ranging from –100°F to 575°F.

*T.M. E. I. du Pont de Nemours & Co., Inc.

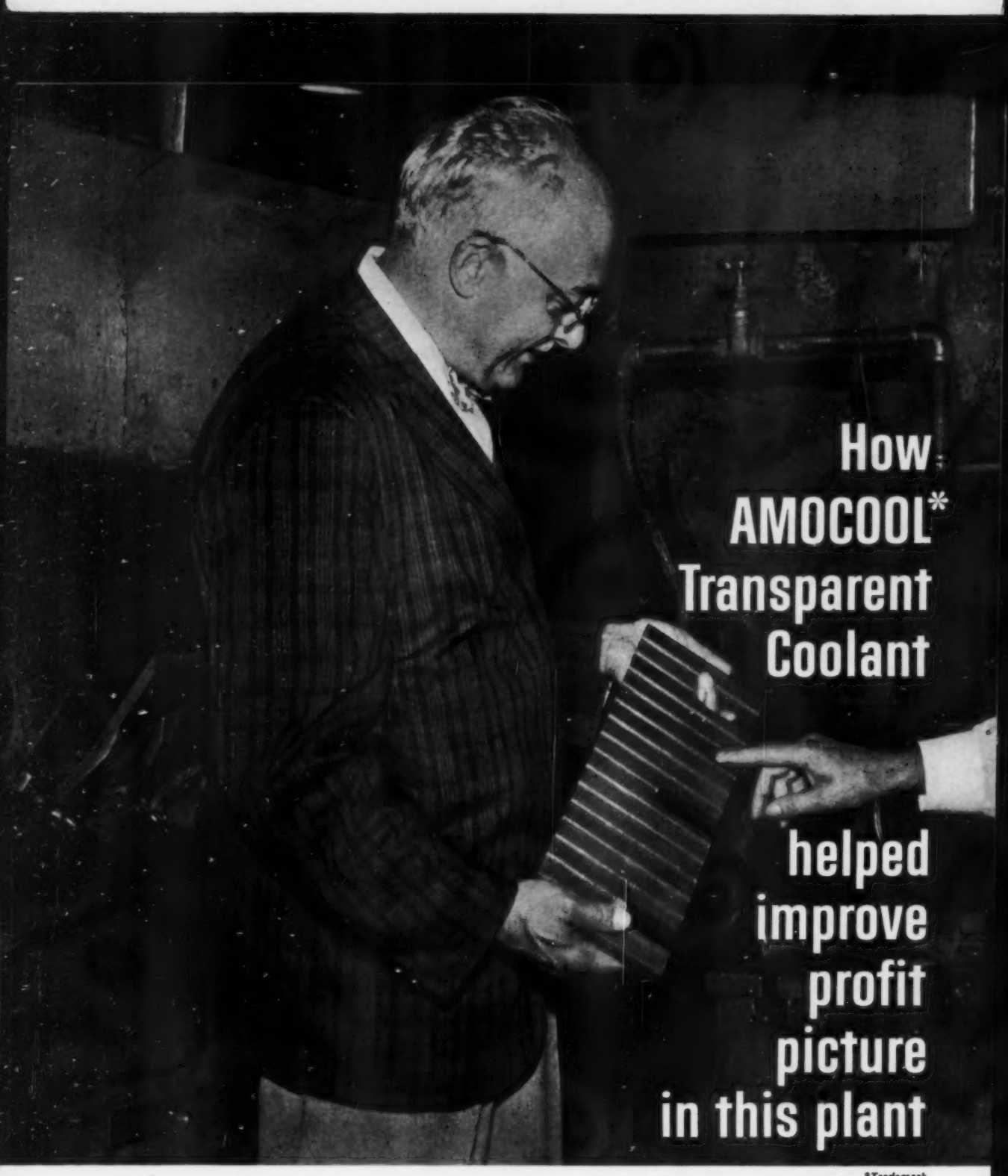
When writing, refer to CL-105

"Moly" GIVES WIRE ROPE 45% MORE BENDING LIFE

That's the forthright verdict of one of the leading wire rope manufacturers, which recently tested its MoS_2-lubricated wire rope against four other leading brands. Fatigue tests and field tests demonstrated the rope's ability to outlast other premium wire ropes in service.

Used as an ingredient in wire drawing compound, Molysulfide creates a micro-shield around each wire. This smooths out minute surface imperfections and prevents the wires from grinding together as the rope flexes. Result: reduction of internal friction —better resistance to fatigue—far longer rope life.

When writing, refer to CL-106



How AMOCOOL* Transparent Coolant helped improve profit picture in this plant

*Trademark

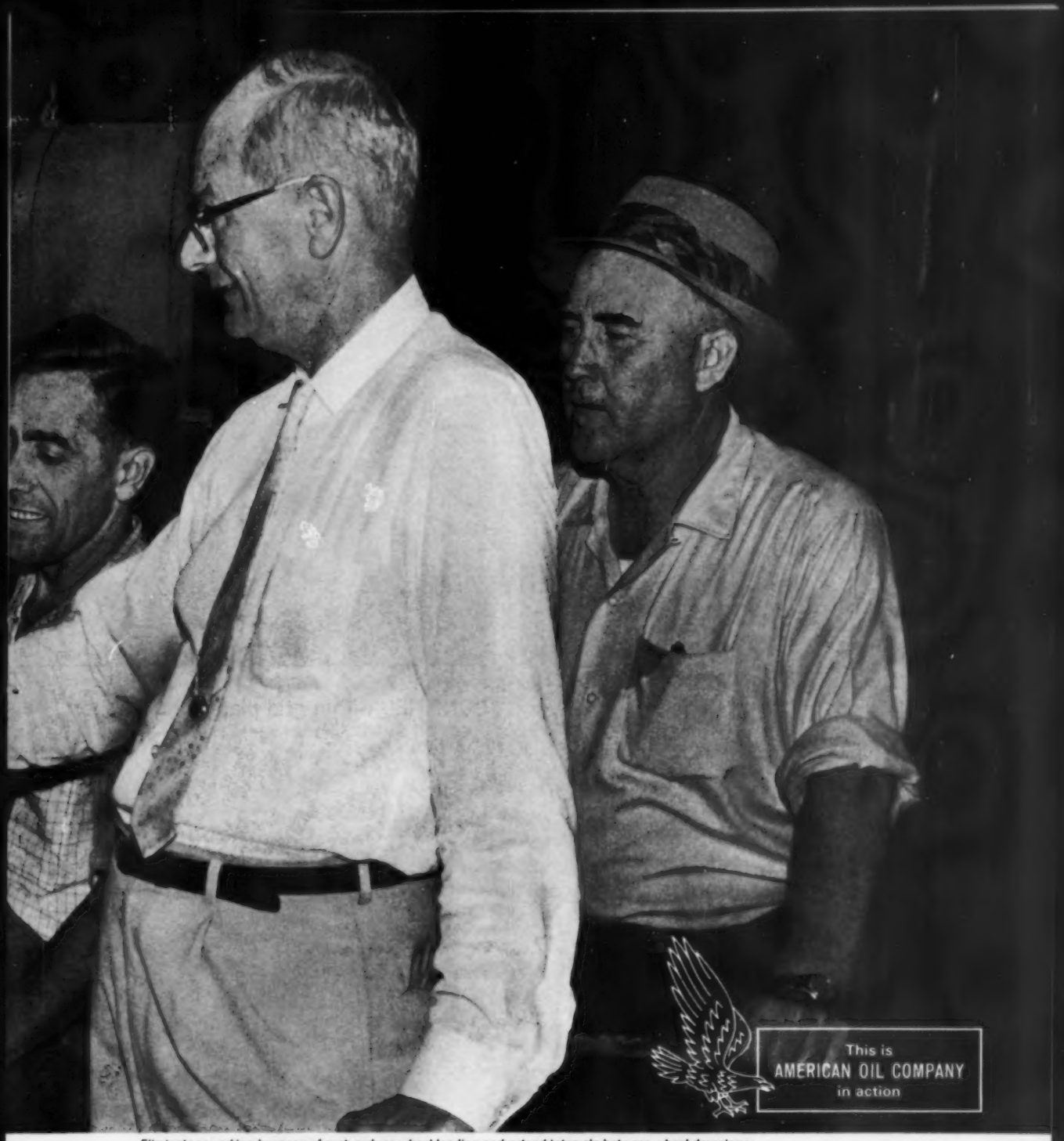
BY PAUL E. "PAPPY" STRATTON

About the Author. "Pappy" Stratton has been providing technical help on lubrication and metalworking problems to customers in the Detroit area for nearly all of the twenty-five years he has been working for the company. In addition to having this store of practical experience to help him, Pappy has completed the Company's Sales Engineering School.

* * *

By using a soap-base grinding compound, Detroit Edge Tool Company was getting excessive corrosion and rust on work and grinding machines. Oil vapor was collecting on machines and on the ceiling, causing dirty working conditions. Most important, high wheel loading was causing frequent down-time for wheel dressings.

We worked out a test program on AMOCOOL Transparent Coolant with the management. On our first test on one surface grinder, feed pressure was cut substantially while at the same time metal removal was increased.



Eliminate reworking because of rust, reduce wheel loading and extend intervals between wheel dressings; do these and you increase profit per unit, explains Detroit Edge Tool president, Dan Ebbing, to P. E. "Pappy" Stratton of American Oil. Plant manager, John Yonker (right) and Sam Vineh, operator, look on.

The cost of reworking parts to remove rust was eliminated. Time required to clean machines to get rid of the odor was cut in half. Less wheel loading and fewer wheel dressings have upped production and reduced costs. Our test program paid out in an improved profit picture. All grinding and drilling equipment has been converted to AMOCOOL Transparent Coolant.

Would you like this kind of technical help to assist you in improving profits? Get it by calling the American Oil Company office nearest you.

Quick facts about
AMOCOOL
Transparent Coolant

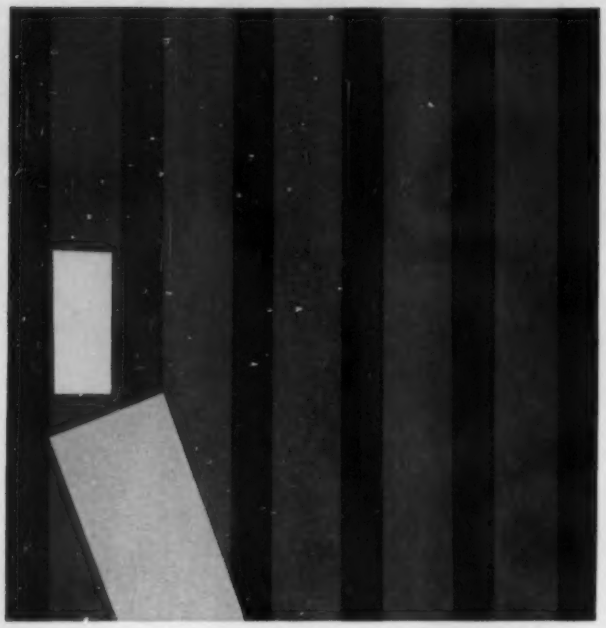
- Clear, transparent fluid
- Controls corrosion on work and machines
- All chemical. Does not support bacteria growth
- Unaffected by humidity
- Fire resistant.
- Odorless

AMERICAN

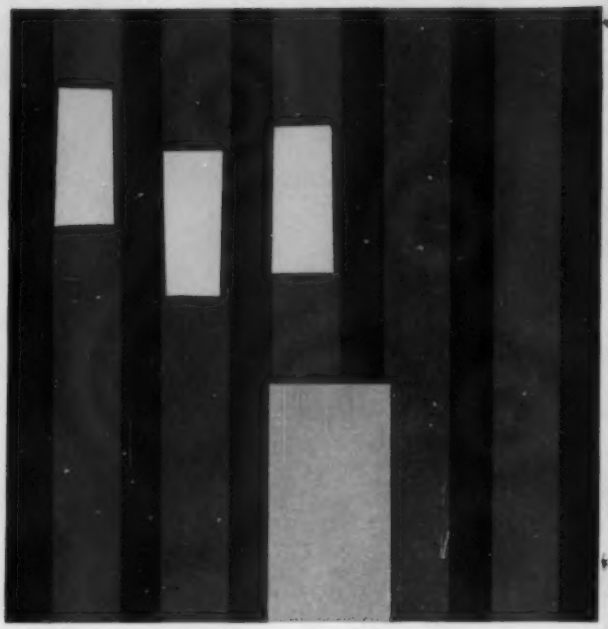
AMERICAN OIL COMPANY
910 South Michigan Avenue
Chicago 80, Illinois

Circle 506 on postcard, page 33

How the Westinghouse De-ion® Arc Chute

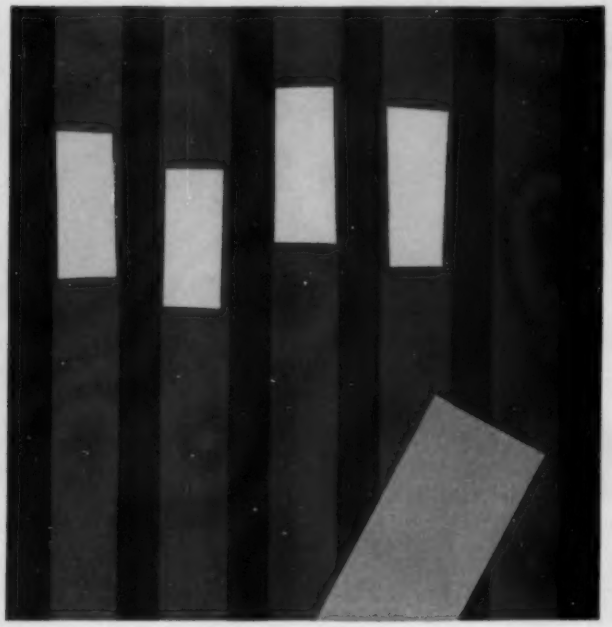


ARC FORMED on interrupting

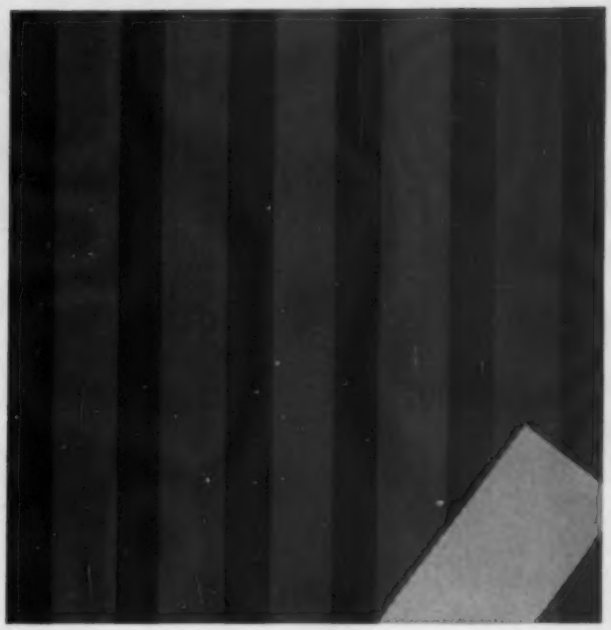


CONFINED within grid plates of quencher

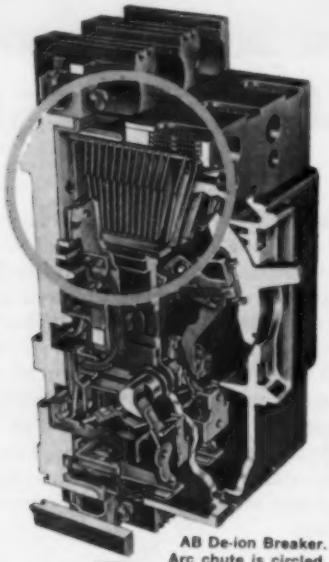
extinguishes breaker arcs in ½-cycle or less!



DIVIDED into small, harmless segments



EXTINGUISHED by the mass of grid plates



AB De-ion Breaker. Arc chute is circled.

Every time you break an electric circuit, an arc is formed. This arc must be controlled quickly and safely to protect the system. The finest and safest device to control arcs is the DE-ION® arc quencher in *all* Westinghouse AB circuit breakers.

The design of the chamber confines the arc and quenches it by dividing it into small harmless segments which are cooled and extinguished by the mass of surrounding material. The action within the arc chute is quick and positive.

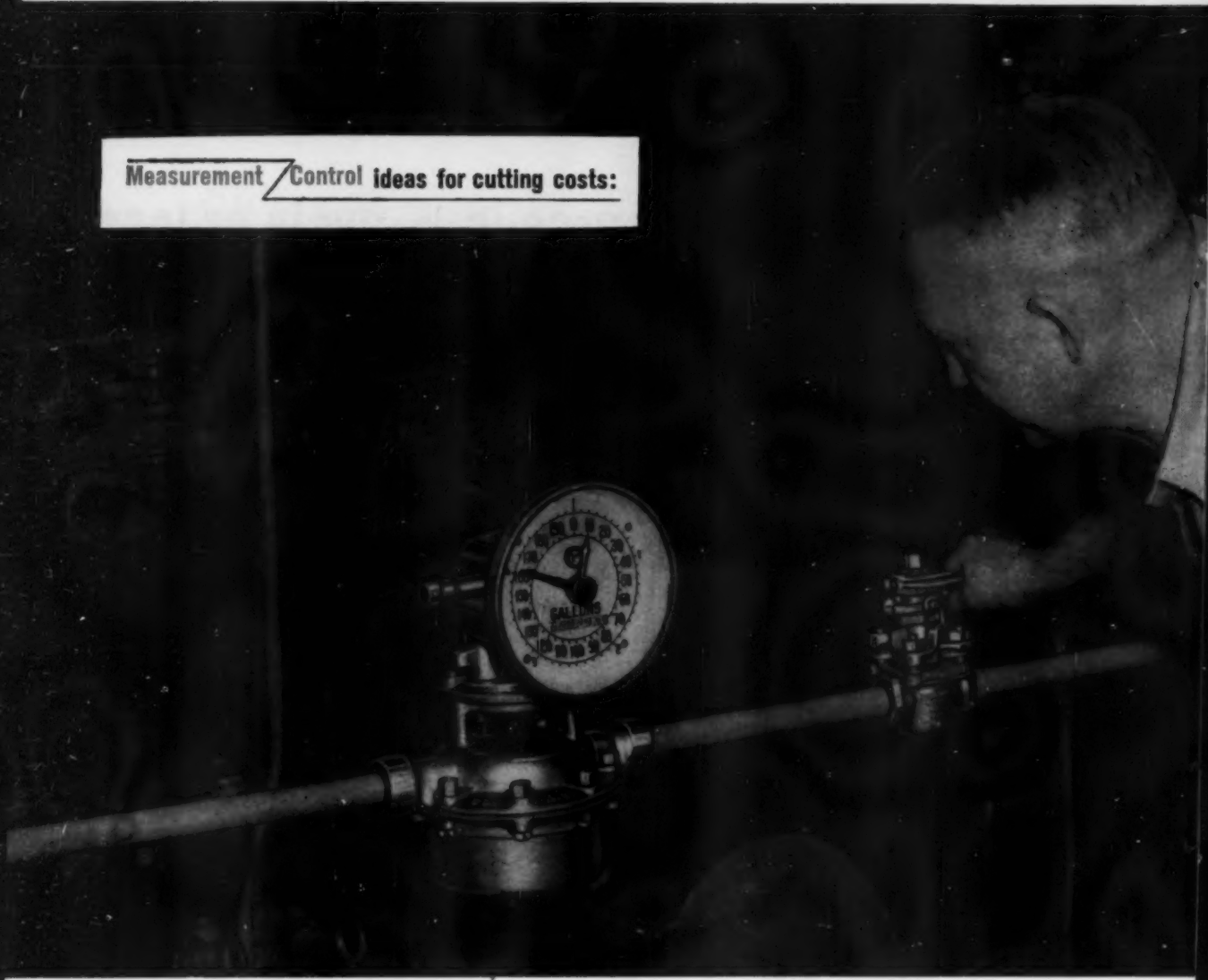
See the quenching action in full color in Westinghouse's "Arc in Action" high speed photography flip book. It's free . . . ask your Westinghouse representative for a copy of SA-8900 or write: Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa. *You can be sure . . . if it's Westinghouse.*

J-30327

Westinghouse

Circle 507 on postcard, page 33

Measurement / Control ideas for cutting costs:



HOW TO SAVE TAX DOLLARS THESE DAYS

Profit these days always has to be concerned with the phrase "after taxes." At a large process plant sewage taxes were being paid on the basis of all water consumed. But a sizable portion of this water was actually used as "raw material" for finished products and never reached the sewage lines. A Rockwell engineer suggested putting liquid meters* on process units to accurately record the water consumed in production. By proving that large quantities of water going into the plant were not discharged as waste, sewage tax bills were cut drastically.

This is just one example of the many ways a Rockwell field engineer can help you track down new and different ways to cut plant costs with measurement and flow control devices. Rockwell has more experience than any other single source for this kind of cost cutting. That's because Rockwell, as the world's largest manufacturer of a complete line of meters, valves and regulators, has been asked to solve more problems.

Wherever liquids, gases or slurries flow through pipes in your plant, you probably can save time, money or materials with new or improved methods of measurement and control. It's easy to find these cost cutting opportunities—just have a Rockwell field engineer visit your plant by sending in the coupon today.

* *Rockwell makes meters to measure a variety of liquids—water, oil, chemicals and other industrial fluids.*

ROCKWELL

The leading single source for Measurement / Control products and ideas

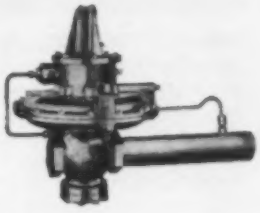
"IN-PLANT" METERING:

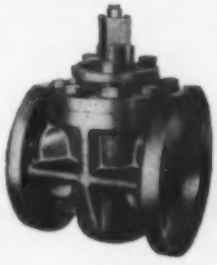
LIQUIDS AND GASES

Rockwell gas and liquid meters, properly applied, can improve quality control, sharpen cost control, and prevent waste in almost every plant department. A Rockwell Field Engineer can help you find *where* meters will cut costs . . . and Rockwell has a complete line of meters to measure practically anything that will flow through pipe.

CONTROLLING PIPED MATERIAL:

LIQUIDS AND GASES





More efficient control of all the material flowing through pipes in your plant is a positive step in cutting costs. There are new applications and new ideas for using gas pressure regulators and valves that will stop wasteful, inefficient, and dangerous handling of fuels, production fluids, and products. A Rockwell Field Engineer can show you *where* and *how*.

HOW MUCH COULD YOU SAVE?

There is hardly a plant anywhere—including yours—where the right application of the right measurement and control methods and equipment won't produce savings many times the modest cost involved. Certainly it's worth investigating—especially since it will cost you nothing to find out. Simply mail the coupon now.

SEND COUPON TODAY

MEASUREMENT AND CONTROL DEVICES

all fine products by

ROCKWELL

Rockwell Manufacturing Company, Dept. MC2H. Pittsburgh 8, Pa.

Please send me literature as checked:

- ☐ Valving gas, liquids and slurries. Bulletin V-621
- ☐ Measuring gases. Bulletin 1085
- ☐ Regulating gas pressures. Bulletins 1044, 1058, 1082, 1086
- ☐ Measuring liquids. Bulletins P-100, PI-866, OG-400
- ☐ Condensed catalog of all products. Bulletin C-5000
- ☐ Please have your Field Engineer call.

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

Circle 558 on postcard, page 33

SUN CUTTING OIL SAVES SIX WAYS. A typewriter manufacturer was producing pins, fasteners, and other parts from Bessemer screw stock on Brown and Sharpes and New Britain Gridleys. Finishes were poor, production slow, tool life below average. Work from cut-off was too hot to handle and there was excessive smoking. Analysis showed the cutting oil was deficient in antiweld and lubricity. Sunicut 11 Cutting Oil was recommended and its use resulted in immediate improvement in all trouble areas. In addition . . . savings on oil cost alone ran $6300 a year, proof that Sun quality does not mean a premium price!

SWITCH TO A SUN GREASE STOPS TROUBLE! A system of delicately balanced propellers produces the big wind in this huge transonic wind tunnel. Control mechanisms at the roots of the blades consist of several small sets of spur gears, antifriction bearings on gear shafts, and four 10-inch antifriction thrust bearings. *Oil* was being used for lubrication, but oil leaked . . . caused unbalance, violent vibration, gear and bearing failures. Sun 1897 *Grease* was recommended. An assembly was packed; leakage stopped. After 18 months, the Sun grease was still in service; not one bearing or gear failure had occurred!

Are you stymied by the question:

SUNOCO

QUALITY . . .
THE BEST ECONOMY OF ALL

Actually,
the answer is
simple enough:

SUN OIL COMPANY

HYDRAULIC OILS, SUNOCO SERVICE CUT LOSS! A molder of fiber glass products operates several plants. In one, leakage was causing frequent downtime of six presses molding fiber glass trays. A Sun man analyzed the trouble, recommended Suntac 302, one of the many Suntac oils designed to combat leakage in hydraulic and circulating systems. At another plant, production of boat hulls like the one shown here was stymied by a contaminated oil. The Sun man swung into action . . . brought in equipment to salvage the oil, saving a sizeable sum through *service*. Now job-fitted Sun Solnus 300 is *keeping* production rolling!

SOLNUS OIL CUTS MAINTENANCE 50%! A Pennsylvania manufacturer compared performance of his regular compressor oil with Sun Solnus 300 in a Chicago Pneumatic air compressor for two rigid test periods of eight months each. The Solnus 300 cut discharge valve maintenance from 4.12 manhours per month to 1.82, intake valve maintenance from 5.68 to 3.00, and all valve maintenance from 9.87 to 4.87 . . . maintenance savings of 50%. Dollar savings ran a tidy $915 a year! Where can your Sun Representative help you save with the quality performance of the right job-fitted Sunoco product for you?

Which petroleum product?

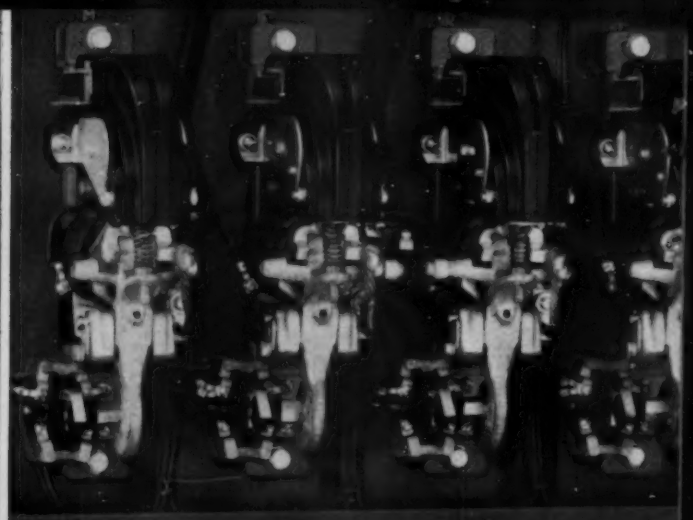
Get the *product quality* it takes to keep you rolling . . . job-fitted by men who *know what they're doing* . . . teamed with the *service* you have a right to expect! Try a Sunoco product in your plant. It's the fastest way to convince yourself that investing in Sun quality can be good for you.

PHILADELPHIA 3, PA., DEPT. PY-8 • **In Canada, Sun Oil Company Limited, Toronto and Montreal.**

Circle 509 on postcard, page 33

Circle 510 on postcard, page 33 ➔

NEW! **COMPACT 300 VOLT CONTROL RELAY** Space-savingest relay ever! So reliable it is permanently enclosed.



NEW! **D-C UNITIZED CONTACTORS.** For steel or slate panels, front or back wiring. Six sizes 25 to 600 amperes.

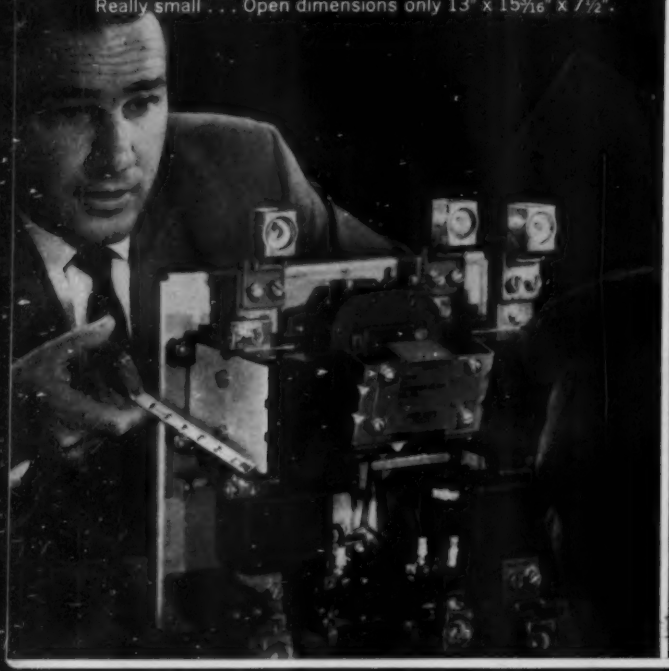
New from Cutler-Hammer

New products, new ideas to help your business now

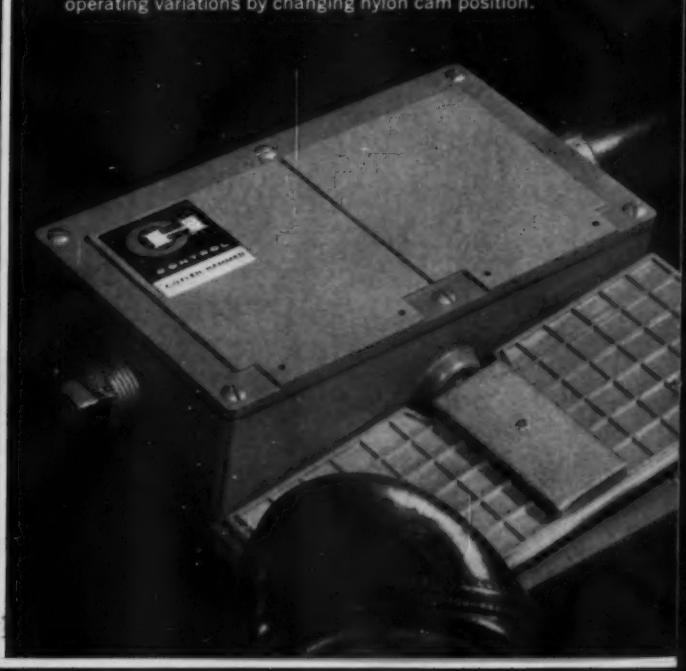
The air is charged with new ideas at Cutler-Hammer . . . ideas and products resulting from our new production facilities, new engineering talent, new research programs, and most important of all—*a new desire to serve you better in the sixties.* Evidence of this vitality and what it can mean to you are these eight typical new products.

You can expect more news from Cutler-Hammer around the calendar. Give your Cutler-Hammer sales office or distributor a call. They're all charged up too—anxious to tell you more about *what's new at Cutler-Hammer.* For descriptive literature on any of these products, write Cutler-Hammer or call your nearest Cutler-Hammer distributor.

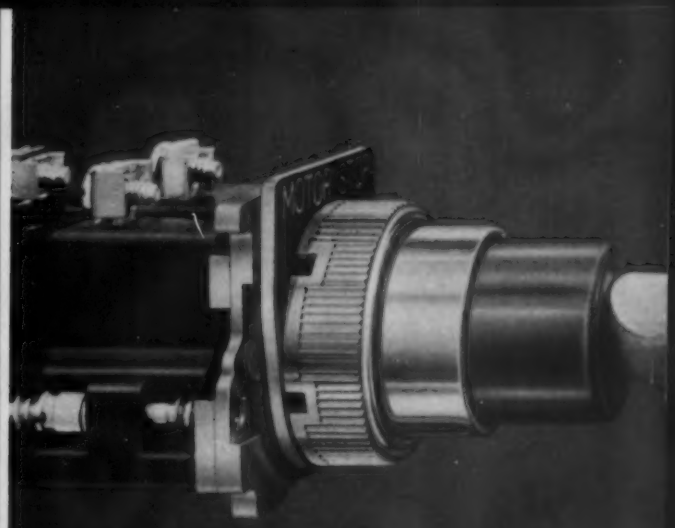
NEW! **SIZE 5 STARTER** Available as starter or contactor. Really small . . . Open dimensions only 13" x 15 5/16" x 7½".



NEW! **MOST VERSATILE FOOT SWITCH YET** Choice of 4 operating variations by changing nylon cam position.



NEW! **UNITROL DESIGN** in choice of three depths (20", 15", 12") gives more flexible motor control center.



NEW! **ILLUMINATED PUSHBUTTONS** Newest addition to this versatile oiltight line. Dozens of types, many colors.

WHAT'S NEW? ASK...

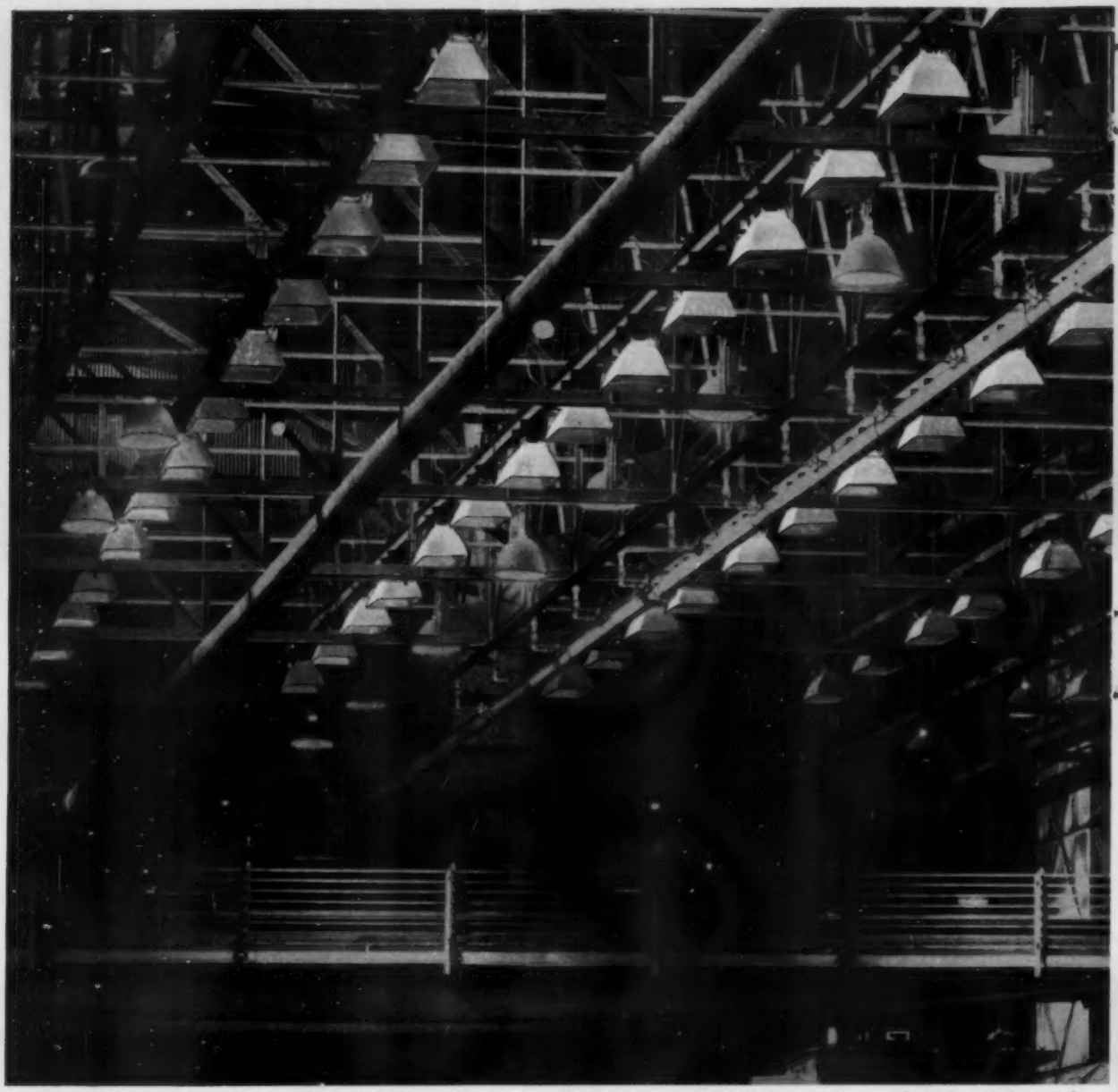
CUTLER-HAMMER

CONTROL

Cutler-Hammer Inc., Milwaukee, Wisconsin • Division: Airborne Instruments Laboratory • Subsidiary: Cutler-Hammer International, C. A. • Associates: Cutler-Hammer Canada, Ltd.; Cutler-Hammer Mexicana, S. A.

NEW! **SPACE-SAVING 00 STARTER** Takes 20% less space, costs 18% less than Size 0.

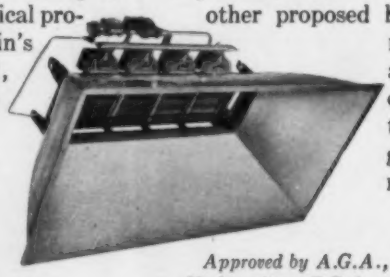
NEW! **MOST RELIABLE LIMIT SWITCH EVER** This oiltight switch outlasts others by far. Many operator options.



300 (48,000 BTU/H) Perfection Schwank Gas Infra-Red Heaters Mounted at a height of 36 ft., heat the area of 100 ft. wide by 500 ft.*

J & L Steel Saves 46% in BTU's with

Minimum 55° machinery temperature is necessary to guarantee peak operating efficiency of critical production equipment at Jones & Laughlin's No. 1 Continuous Weld Pipe Mill, Aliquippa, Pa. Replacing their previous heating equipment, 300 Perfection Schwank *Gas* Infra-Red Heaters (600 in the entire plant) meet this tough requirement with a BTU capacity 46% less than any other proposed heating system. Total maintenance requirements consist of air blowing the gas-fired units once each heating season. After three full seasons of dependable gas heat and employee comfort, not one of the 2,400 ceramic



Approved by A.G.A., Underwriters, C.G.A. and C.S.A.

long without partitions or walls to adjoining plant areas. These gas-fired heaters are part of the 600 installed at J & L's Aliquippa Works.

Perfection Schwank Gas Infra-Red Heaters

burners (4 per heater) has needed replacement.

Perfection Schwank *Gas* Infra-Red Heaters give J & L all the advantages of modern *gas* heat . . . high efficiency, precise control, speed, cleanliness, economy and dependability of supply. Gas can be the answer to your unusual or everyday heating problems.

Heat better for less with Perfection Schwank *Gas* Infra-Red Heaters. For complete information, contact your local Gas Company or write to Perfection Division of Hupp Corporation, licensee of American Infra-Red Radiant Co., 1135 Ivanhoe Road, Cleveland 10, Ohio. *American Gas Association*

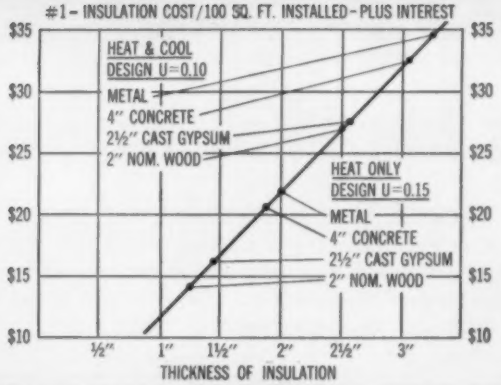
*Under Schwank U.S. Patents 2,775,294 and 2,870,830 and pending applications.

FOR HEATING GAS IS GOOD BUSINESS!

Circle 511 on postcard, page 33

Now–all the J-M FESCO®

#1 – INSULATION COST/100 SQ. FT. INSTALLED – PLUS INTEREST



#2 – YEARS TO RECOVER INVESTMENT IN ADDED INSULATION (PER 100 SQ. FT.) AND ANNUAL RETURN ON INVESTMENT

	HEAT ONLY (U=0.15)		HEAT & COOL (U=0.10)	
	NORTH	SOUTH	NORTH	SOUTH
METAL DECK	2¾	4	3¾	5½
4" CONCRETE	2½	3¾	3½	5
2½" CAST GYPSUM	2	3	3	4¼
2" NOM. WOOD	1¾	2½	2¾	4
ANNUAL RETURN ON INVESTMENT	$8.30	$5.60	$9.55	$6.45

APPROXIMATE INSTALLED COST *of various thicknesses of Fesco Board, together with the appropriate thickness over typical roof decks to meet design factors of U=0.15 BTU/HR/°/sq. ft. loss through the roof assembly for buildings that require only winter heat . . . and U=0.10 BTU/HR/°/sq. ft. for air-conditioned structures.*

INVESTMENT RECOVERY *—showing how soon you will recover your additional investment in insulation . . . and showing amount of return on your investment for life of equipment.*

BOARD you can use!

New production facilities in full swing to meet your demands for this remarkable new roof insulation

HOW YOU CAN TAKE ADVANTAGE OF THE INCREASED AVAILABILITY OF FESCO BOARD FOR OPTIMUM THERMAL ROOF DESIGN. The use of increased amounts of insulation is today an economically sound practice. Greater thicknesses of roof insulation are required to reduce the rate at which a modern air-conditioned building gains or loses heat . . . to reduce condensation . . . and above all, to provide an acceptable comfort level for the occupants.

This added roof insulation, of course, means an additional capital investment by the owner. Table #1 (below) shows installed insulation costs for heated-only, and for heated/air-conditioned buildings.

However, the cost of the added insulation *pays for itself* in 2 to 5 years, as shown in Table #2.

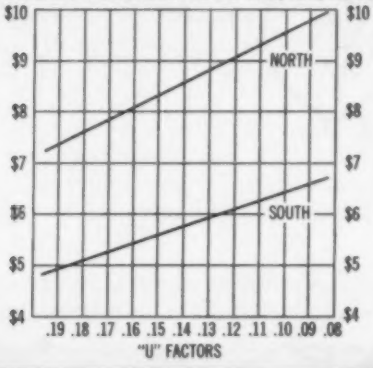
Then, after the building owner has recovered his initial investment, permanent Fesco Board roof insulation continues to pay a big dividend in heating/cooling savings each year the building is in operation. These savings—for both northern and southern locations—are shown in Table #3.

WHY FESCO BOARD IS SUCH AN EFFICIENT ROOF INSULATION. Fesco Board is an asphalt-impregnated board, formed of expanded perlite particles, mineral binders and fibers. When perlite—a volcanic rock—is expanded at temperatures greater than 1700 F, it is transformed into light-weight, sealed beads of volcanic glass, honeycombed with dead air cells. These perlite particles provide Fesco Board with its unusually excellent thermal insulation qualities . . . along with incombustibility, moisture resistance, permanence, light-weight, dimensional stability, compression resistance and fabrication ease. Fesco Board is available in thicknesses of ½" to 3½", in ½" increments.

For an illustrated folder on Fesco Board, write to Johns-Manville, Box 158, Dept. PE-8, New York 16, N. Y. In Canada, address Port Credit, Ont.

JOHNS-MANVILLE JM PRODUCTS

#3 - TOTAL OPERATING SAVINGS - HEAT & COOL/YEAR/100 SQ. FT.



SAVINGS *in total operating costs, including first cost of equipment for heated and air-conditioned buildings per 100 sq. ft. of roof area for various U values.*

Circle 512 on postcard, page 33

DISTRIBUTOR DAN, the SKF bearing man, says:

"PUT UP THIS NEW WALL CHART... AND YOU'LL LOWER THE COST OF BEARING MAINTENANCE!"

Add up the costs of downtime, maintenance and bearing replacement. They may total much more than you think. So, how can you reduce them? It's easy—put up this bearing maintenance chart where your crew can refer to it often. Just look at its contents! It tells how to keep bearings lubricated • how to prevent overheating • how to protect bearings from dirt • and how to check bearings during run-in—to prevent damage and downtime later. Every plant needs at least one copy of this bearing chart, and perhaps more.

JUST ASK YOUR AUTHORIZED SKF DISTRIBUTOR FOR AS MANY AS YOU NEED. SHOULD HE BE OUT OF SUPPLY—WRITE US DIRECT: ADVERTISING DEPARTMENT, SKF INDUSTRIES, INC., P. O. BOX 6731, PHILADELPHIA 32, PENNSYLVANIA.

6120

BEARING BULLETINS
5 TIPS ON BEARING LUBRICATION
that can save time and trouble for you
WHY BEARINGS BECOME OVERHEATED
and how to correct the conditions that cause excessive heat
WHAT DIRT DOES TO BEARINGS
and how you can help keep it out
HOW TO CHECK BEARINGS DURING RUN-IN
to prevent damage and downtime later

SKF MOTION ENGINEERING

Advanced ball and roller bearing technology

Circle 513 on postcard, page 33

These Gates Hoses are in use on this Atlas project:
HEAVY DUTY WATER HOSE
SUCTION AND DISCHARGE HOSE
120SS—Rugged, for heavy duty petroleum transfer.
WIRE BRAID AIR DRILL HOSE
18MB—A premium hose for extra heavy duty. Flexible, easy to handle.
ALL-PURPOSE OIL-PROOF HOSE
19B—Gives long service handling oil, gasoline, grease, air and water.

Atlas Missile Base contractor relies on Gates Hose

In building a group of 12 emplacements for the Atlas ICBM near Salina, Kansas, Gates Hose was chosen by the prime contractor for use throughout the construction. Thousands of feet of Gates Hose for air, suction and discharge, water and steam are giving outstanding service in constant use under severe working conditions.

This project is under the supervision of the U.S. Army Corps of Engineers. The contractors are Utah-Manhattan-Sundt, a joint venture headquartered in San Francisco.

Gates makes a hose for every industrial application—every type of hose in a full range of sizes. All are dependable, top-quality products of Gates continuing program of *Specialized* Research.

You get fast delivery from local stocks. The hundreds of Gates Distributors, located in all parts of the country and throughout the world, have large stocks of hose on hand, backed by Gates Stocking Service Centers in every major industrial area.

This means that you always get quick delivery of Gates Hose from a local source.

Call your nearby Gates Distributor when you need hose of any kind, for any purpose.

OTHER TOP-QUALITY GATES INDUSTRIAL HOSES INCLUDE:

- Pump Suction and Discharge Hose
- General Purpose Water Hose
- Food Handling and Material Handling Hose
- Gasoline and Oil Hose
- Jetting and High Pressure Water Hose
- Engine Coolant Hose
- Welding Hose
- Hydraulic Hose

A Gates Hose for any industrial need is quickly available from your nearby Gates Distributor
Building the future on 30 years of progress
Gates

The Gates Rubber Company, Denver, Colorado BP 48A

Gates Industrial Hose

Circle 514 on postcard, page 33

HELPFUL WATER CONDITIONING DATA FROM BETZ

Operating Pressure, psig	Total Solids ppm	Total Alkalinity ppm	Suspended Solids ppm
0- 300	3500	700	300
301- 450	3000	600	250
451- 600	2500	500	150
601- 750	2000	400	100
751- 900	1500	300	60
901-1000	1250	250	40
1001-1500	1000	200	20
1501-2000	750	150	10
2001 and higher	500	100	5

Figure 1

The American Boiler Manufacturers' Association stipulates in its standard guarantees on steam purity boiler water concentrations shown above.

It should be noted that limits for total solids, alkalinity and suspended solids are stipulated. The effect of dissolved solids, suspended solids and alkalinity on carryover has been a subject of considerable research. In some plants alkalinity is the determining factor, while in other plants it is the total dissolved solids which limit the boiler water concentration that can be maintained without carryover. In general, it is agreed that part for part suspended solids have a more pronounced effect on promoting carryover.

Suspended solids include precipitates which are formed within the boiler as a result of the precipitation of hardness as well as any suspended matter which enters the boiler with the feedwater. Internal boiler water treatment with phosphate control is standard for most types of feedwater, and is designed to precipitate the calcium hardness as calcium phosphate. There is a tendency for finely divided precipitates, such as calcium phosphate, to promote boiler water foam and thus contribute to carryover of boiler water with the steam. In addition, excessive amounts of suspended solids will cause sludge accumulation or scale formation. The heat insulating effect of deposits on heat transfer surfaces can result in the loss of boiler efficiency. Even more important is the possible overheating of the boiler tubes and the consequent tube failures that can result. It is therefore essential that blowdown limits be properly established to avoid the adverse effects of excessive amounts of suspended solids.

High boiler water alkalinity tends to promote foam formation and may also contribute to caustic metal embrittlement. In boilers operating at very high pressures, excessive caustic alkalinity can contribute to caustic corrosion.

EXCESSIVE BOILER BLOWDOWN

■ Close control of blowdown is essential, not only to avoid operating difficulties but also to achieve operating economy.

With the generation of pure steam, all the solids—dissolved and suspended, that enter the boiler with the feedwater remain in the drums and tubes. Continued addition of feedwater results in greater and greater accumulation of solids until some limit is reached beyond which operating difficulties will develop. The limit may be the amount of sludge, the dissolved solids or some component of the dissolved solids—such as the alkalinity or silica concentration. Every individual boiler has some limiting factor which if exceeded will eventually produce operating difficulties. In addition to the chemical factors, there are many mechanical factors that influence the boiler water concentrations which can be maintained safely in a particular unit. These include boiler design, pressure, rating, water level and load characteristics.

The purpose of boiler water blowdown is to control concentrations—both dissolved and suspended—within safe limits so as to assure trouble-free operation. The objective is accomplished by ejecting some of the concentrated water from the boiler and replacing it with feedwater. The rate of boiler blowdown is defined as the ratio of the quantity of blowdown water to the quantity of feedwater and is expressed usually in percentage as follows:

$$\frac{\text{Quantity of Blowdown Water}}{\text{Quantity of Feedwater}} (100) = \% \text{ Blowdown}$$

Chemical Factors

Excessive amounts of total solids—both dissolved and suspended—can promote carryover of boiler water with the steam. When boiler water solids are carried over in the steam, deposits will occur in non-return valves and stop valves, superheaters, steam piping and engines or turbines. Serious loss to turbine efficiency may result or incrustations on governor valves may cause over-speeding or wrecking of the machine. It is essential that safe boiler water operating limits be established to avoid carryover.

One other very important factor that must be taken into consideration is boiler water silica concentrations. Very high boiler water silica concentrations are undesirable due to the danger of silica deposition, or the formation of very hard complex types of silica scales such as analcite and acmite. In addition, in boilers operating above 400 psi gage, high silica concentrations can result in silica vaporization and the formation of siliceous deposits on turbine blading. Suggested permissible limits for boiler

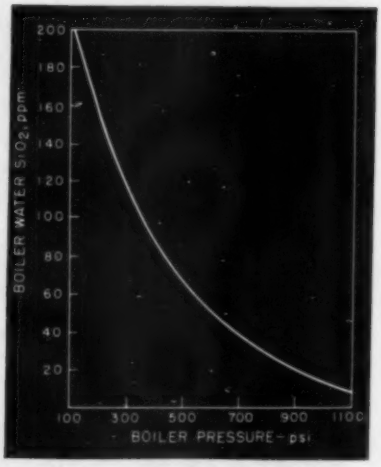


Figure 2

water silica concentrations are shown in Figure 2.

Mechanical Factors

Boiler design has a marked influence on the safe limits that can be maintained both from the standpoint of carryover and deposit formation. It is obvious that in some of the older boiler designs, where all steam carrying tubes discharge below the water level, a great deal more turbulence results in the boiler drum compared to the more modern designs where steam carrying tubes enter the drum above the water level or through separating devices.

Boiler design must also take into account the effect of operating pressure. At high boiler pressures, the difference in water-steam density decreases and the effect of gravity on water and steam separation is decreased.

High water level is one of the most frequently encountered causes of carryover as well as one of the easiest to correct. The method of firing a boiler may be such as to disturb circulation and contribute to carryover.

Obviously, operating a boiler at loads in excess of designed rating will provide more cause for carryover than operating within the designed rating. Sudden load changes will cause more difficulty than steady loads.

Each of these factors has a bearing on establishing safe limits for an individual boiler to avoid carryover. Boiler circulation, type firing and particularly 'hot spots' in the boiler have a substantial effect on sludge accumulation and scale formation.

Blowdown Economy

High blowdown rates are wasteful. In addition to the heat loss, an increase in make-up water is required. If the make-up water is treated the added cost of external treatment is a factor, as well as the added cost for internal treatment. Therefore it is desirable to establish a blowdown rate that is adequate to assure trouble-free operation of the boiler, and yet is not excessive so that costs are held to a minimum.

The ABMA limits should be viewed only as a guide in establishing safe operating limits for any individual boiler. The many variables that affect the establishment of safe limits must be taken into consideration. In some cases, because of boiler design or high silica values, it may be necessary to establish limits well below ABMA stipulations. In these cases improved external treatment methods may be helpful. Conversely, in many cases it is possible to establish limits well above ABMA stipulations and thereby secure greater economy. The antifoam agents that have been developed in recent years, when properly applied, frequently will permit establishing limits considerably above ABMA stipulations and still permit generating steam of excellent purity. The advances made through research in the development of sludge conditioning agents frequently permit higher suspended solids than ABMA stipulations. A thorough investigation of all factors involved will determine whether or not some improvement in the external or internal feed-water conditioning program will permit blowdown savings which will more than off-set the cost of the improved method of treatment. Figure 3 illustrates the savings in fuel alone which can be accomplished by a reduction in blowdown rate from 6% to 2%.

CAN BE COSTLY

Evaporation	= 2,000,000 lbs. steam
Boiler Pressure	= 200 psi gage
Feedwater Temperature	= 215 F
Make-up Water Temperature	= 60 F
Present Blowdown Rate	= 6%
Reduced Blowdown Rate	= 2%
Boiler Efficiency	= 80%
Fuel = Oil at 150,000 Btu/gal., 7.0c/gal. delivered and fired	
Feedwater	= Steam plus blowdown
Feedwater at 6.0% Blowdown	= 2,128,000 lbs.
Feedwater at 2.0% Blowdown	= 2,041,000 lbs.
Saving in Feedwater	= 87,000 lbs.
Heat of Liquid at Boiler Pressure	= 362 Btu/lb.
Heat of Liquid at 60 F	= 28 Btu/lb.
Heat Saving	= 334 Btu/lb.
Total Heat Saving = 87,000 lbs. x 334 Btu/lb.	= 29,058,000 Btu
At Boiler Efficiency of 80% There is Actually Utilized 150,000 Btu/gal. x 0.80	= 120,000 Btu/gal.

$$\text{FUEL SAVINGS} = \frac{29{,}058{,}000 \text{ Btu}}{120{,}000 \text{ Btu/gal.}} = 242 \text{ gal.}$$

DAILY SAVINGS = 242 gal. oil x $0.07/gal. = $16.94

Figure 3—Typical Calculations on Savings Possible Through Reduction in Blowdown Basis—1 Day

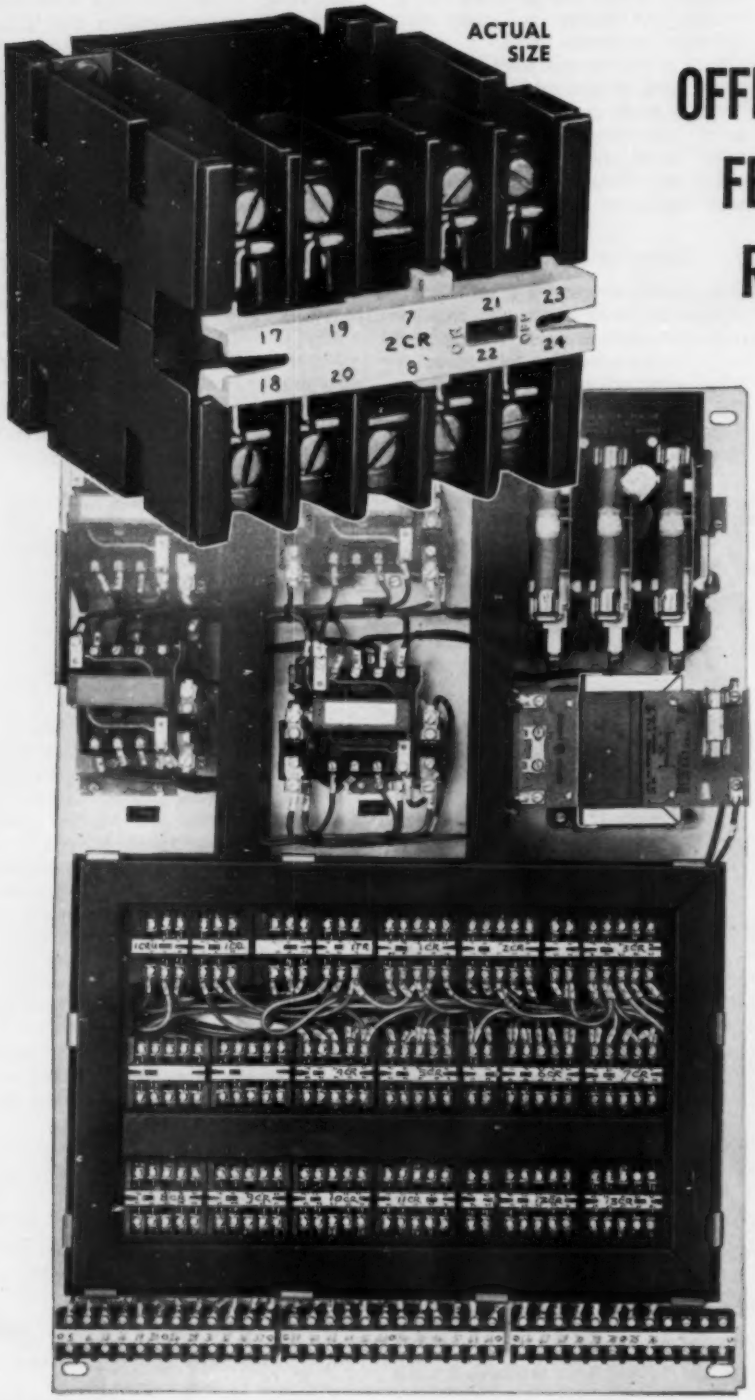
In every plant the subject of blowdown is sufficiently important to justify a study of all the factors involved. Betz has the products and ability to handle all phases of your boiler water conditioning problems effectively and economically. A Betz Engineer will be pleased to discuss your water conditioning problem. Why not contact him today.

BETZ LABORATORIES, INC.

PHILADELPHIA 24, PENNSYLVANIA

■ CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

NEW General Electric 10-amp,



SNAP-IN TROUGH COVER between top and middle rows of relays (on lower half of panel above) has been removed to show how relay sides form own wiring trough. Space-consuming wiring trough is eliminated, and relays can be mounted closer together.

OFFERS 4 SIGNIFICANT FEATURES NO OTHER RELAY CAN MATCH!

1. *ONLY* 300-VOLT RELAY WITH CONVERTIBLE CONTACTS

You can change contacts from normally open to normally closed in 90 seconds . . . with only a screwdriver. Coils too, can be changed in seconds . . . and you can make up any form you need through 8 poles from basic 4-pole relay. Result: increased flexibility, reduced inventory costs.

2. *ONLY* 300-VOLT RELAY TO FORM ITS OWN WIRING TROUGH

New CR120 relays eliminate need for separate wiring trough—require only 5⅝ square inches of mounting area. Result: panel size is substantially reduced because you can mount more relays in a given space.

3. *ONLY* 300-VOLT RELAY WITH ALL TERMINALS OUT-IN-FRONT

There's no double-decking of terminals to complicate hook-up. Wiring and maintenance are simple because *all* terminals are out-in-front where they are most accessible. Result: important savings in installation and maintenance time and costs.

4. *ONLY* 300-VOLT RELAY OFFERING ALL THESE FORMS

Choose from standard 2-, 4-, 6-, and 8-pole relays and latched and pneumatic timer forms. Also available are 2-pole adder kits, allowing you to assemble 6- and 8-pole relays from basic 4-pole form.

Your General Electric sales engineer has a sample of this new 300-volt relay. Call him today for a demonstration. Or, write for publication GEA-7329, General Electric Co., Section 811-26, Schenectady 5, New York.

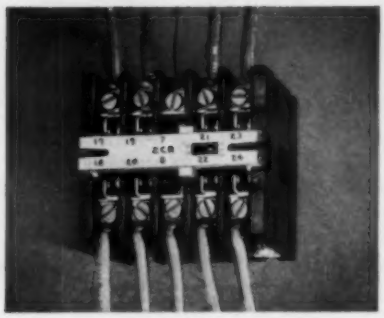
Progress Is Our Most Important Product

GENERAL ELECTRIC

300-volt industrial relay...

Save Panel Space, Installation Time With These Design Features

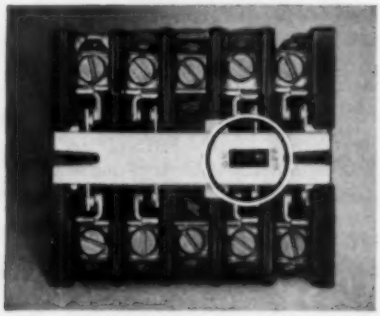
90-SECOND CONTACT CHANGE—Convertible contacts may be changed from normally open to normally closed with only a screwdriver . . . in the field. Allows you circuit flexibility, reduces your relay inventory.



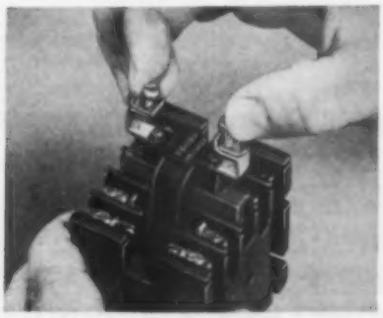
ALL TERMINALS IN FRONT—Have terminal-board accessibility—no need for double-decking . . . even on 8-pole forms. Result: *complete* accessibility from the front means installation time is greatly reduced.

HANDY WRITE-ON MARKING STRIP—White nylon marking strip lets you label each relay and all wires. Result: visual identification of relay and wire numbers saves time when inspecting or trouble shooting.

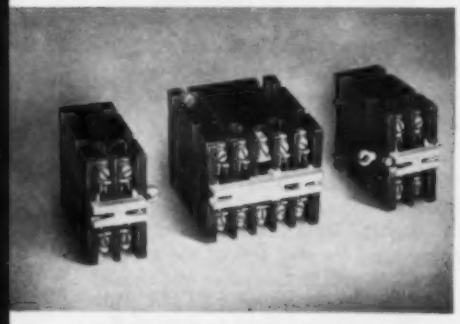
WIDELY-SPACED TERMINAL BARRIERS—Plenty of space between terminal barriers (⅜ inch) allows you easy access with standard screwdriver for connecting leads. Large pan-head screws add to ease of hookup.



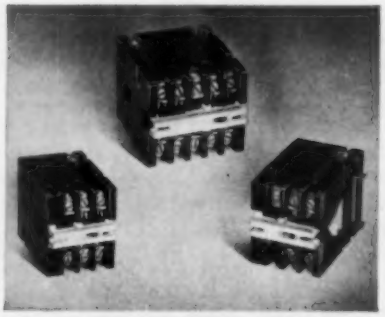
VISIBLE CONTACTS—All contacts are visible at a glance. You can check panel functions manually by moving indicating tab. ON-OFF identification on marking strip indicates whether or not coil is energized.



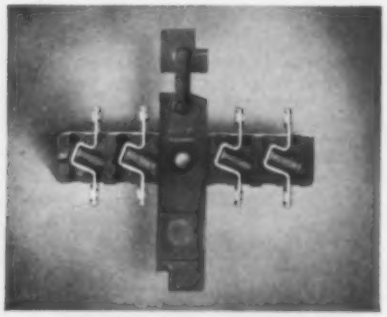
30-SECOND COIL CHANGE—Inspect or replace coil by loosening two screws and pulling out coil. Can be done without the use of special tools . . . and without removing the relay from the panel.



BUILDING BLOCK POLE-ADDERS—Two-pole adders can be mounted on sides of basic relay to give 6- or 8-pole device. Allows you building-block flexibility . . . in the field. All forms also available from factory.



COMPATIBLE DESIGN FOR ALL FORMS—Same design used for latched relays, relays and timer (1 to r). Height, wiring arrangement, and terminal locations are alike for all forms. Result: simplified installation.



HIGH CONTACT FIDELITY—Self-cleaning contacts have unique "scrubbing" action. Movable contact springs are mounted at an angle so contacts slide over each other to wipe off contaminants.

GENERAL ELECTRIC

Circle 516 on postcard, page 33

"THIS LUBRICANT ENABLED US TO INCREASE PRODUCTION"

says—PITTSBURGH TUBE COMPANY

"Our 70,000 pound Draw Bench was designed to operate at a maximum of 80 feet per minute, full load. We decided to increase the drawing speed on lighter tubing to 100 and 104 feet per minute. This overloaded the Speed Reducer, however, causing it to overheat. We tried four different makes of oils without success before trying LUBRIPLATE A.P.G. 90. With LUBRIPLATE, we are able to pull heavier tubing than before at 104 feet per minute without the Reducer overheating."

R. S. Vorous
Maintenance Engineer

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

Circle 517 on postcard, page 33

BACKTALK AND FORETHOUGHTS

Edited by Bea Berghorn

Editorializing!

PLANT ENGINEERING:

"I'm sure you'll be happy to learn that an editorial from your magazine was quoted at a June 8 meeting in the Pittsburgh Hilton Hotel.

"As a part of our program, Karr Parker, President of Buffalo Electric Co., Buffalo, N. Y., commented on current business conditions. As a part of his remarks, he quoted the editorial which appeared in the May, 1961 issue of PLANT ENGINEERING, written by Tom Hanson entitled 'Price Cutting—Fact or Fancy?' Mr. Parker stated that this editorial was certainly a good one and was very thought-provoking.

"We plan on issuing, over our mailing list, the minutes of this meeting. We intend to include this editorial in its entirety with full reference to the publication. We trust this is acceptable to you and your company." *A. E. Wage, Executive Secretary and Treasurer, Westinghouse Agent-Distributors Assn., Pittsburgh, Pa.*

■ We are greatly flattered that Mr. Parker thought enough of our editorial to quote from it at the above-mentioned meeting. Our full permission has been given to use this material.—*Editors.*

Truck Article in Demand

PLANT ENGINEERING:

"Will you please send me a copy of Crane's step-by-step inspection procedure for industrial trucks? This was mentioned in Part III of 'Electric Trucks at Crane' in your May, 1961 issue.

"We are in the process now of reviewing our material handling equipment and have found that these articles contain excellent information." *Thomas R. Peirce, Western Printing and Lithographing Co., Poughkeepsie, New York.*

PLANT ENGINEERING:

"You have a very fine series of articles on electric fork lift operation which appears in your March and April issues, pages 108 and 114 respectively. From your footnote in the April issue, a third part will appear in your May issue. I would be most appreciative of receiving copies of all three parts.

"This is one of the most informative articles on this subject that I have had the pleasure to read. The approach Crane Company took to their problem will help in solving our own mobile equipment troubles." *W. D. Willis, Industrial Engineering, Reynolds Metals Co., Sherwin Plant, Corpus Christi, Texas.*

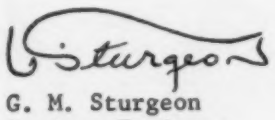
PLANT ENGINEERING:

"I received your letter of June 20 informing me that the supply of tear sheets on 'Why Electric Trucks at Crane?' was exhausted. I do wish, however, to order six reprints of this article, and am enclosing $1.50 to cover cost of same." *Cloyd W. Sowers, Supervisor-Shop Service, Ingersoll-Rand Co., Painted Post, N. Y.*

■ Tear sheets of this popular article are exhausted. However, we do have reprints of the entire three-part article for 25 cents per copy. Quantity prices will be furnished on request.—*Editors.*

Clever Fellas These Engineers!

On a letter we received the other day, The unusual signature appeared this way:



G. M. Sturgeon
Project Engineer

Scientists Prove Popular

PLANT ENGINEERING:

"I would appreciate receiving four tear sheets of the article 'The Care and Maintenance of Scientists', that appeared in the June, 1961 issue of PLANT ENGINEERING." *Robert P. Engvall, Engineer, The Worcester Foundation for Experimental Biology, Shrewsbury, Mass.*

PLANT ENGINEERING:

"In accordance with the invitation extended on page 242 of the June issue of PLANT ENGINEERING, will you please send me two sets of the article 'The Care and Maintenance of Scientists' contained on pages 107, 108, 240 and 242 of the mentioned edition." *E. S. Howarth, Project Manager, Alcoa Technical Center, Aluminum Co. of America, New Kensington, Pa.*

PLANT ENGINEERING:

"Will you please forward to us the articles listed below which appeared in PLANT ENGINEERING's June issue: 'The Care and Maintenance

DEARBORN'S FULL-RANGE PRODUCT LINE SERVES ALL YOUR WATER TREATMENT NEEDS

*Check the Scoreboard!...How many of these does your plant need?**

Boiler Water Treatment, Sludge Conditioners and Anti-Foams	Dearborn® 66, 201, 240, 241, 242, 245, 247, 250, 251, 253AF, 281, 291, 659, 669, 679, 689.
Cooling Water Treatments	Polychrome® 501, 505, 525 and Dearborn 533 with Endcor® A; Dearborn 860 with Endcor B; Dearborn 143, 846, 862, 888.
Steam and condensate Corrosion Inhibitors	Super Filmeen® and Super Filmeen 20—filming amines Alkameen® and Alkatrol —neutralizing amines.
Biocides	Dearcide® 702, 703, 707, 711, 717.
Coagulant Aids	Aquafloc 420, 425, 430.
Process Antifoams	Ex-Foam® 630, 631, 635, 636.
Scale and Deposit Removers	Scale-Cleen —inhibited dry acid. Dearborn 134—inhibited hydrochloric acid.
Consulting Service	Before and after sale—covering all your potential water problems from source through reuse to disposal.
Chemical Feeding Equipment; ion exchange resins	Most complete of any water treatment company.
Experience	Three-quarters of a century—longest of any Company in the field.

*Partial list of products. Most are available in economical powder or easy-to-use briquette form.

Unfortunately, there's no panacea—no universal cure-all—for industrial water treatment problems.

That's why Dearborn's full-range product line—the most complete in the industry—is critically important. Because of it, Dearborn engineers need not "make do" with something almost good enough. They have available the exact chemical combination best suited to the job—combinations developed by Dearborn research laboratories and proved in Dearborn's 75 years of experience—longest in the water treatment field. Many of these product combinations are protected by U. S. patents and are available only from Dearborn.

Dearborn's water treatment division has eleven district offices in the United States and Canada and a trained field staff of 90 to serve you—before and after a sale. Call your nearest representative today. Or write for our Bulletin outlining Dearborn services and how they can end your water treatment problems.

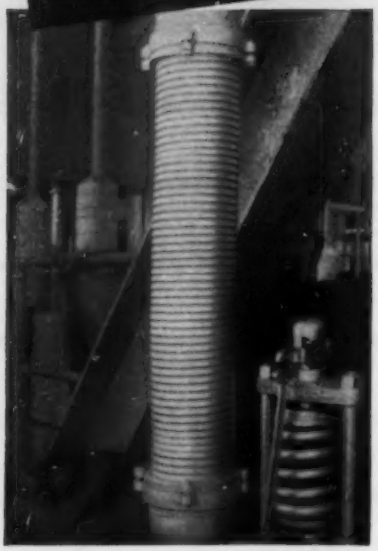
DEARBORN CHEMICAL COMPANY

General Offices: Merchandise Mart, Chicago 54 • Dallas • Des Plaines, Ill. • Ft. Wayne • Honolulu Linden, N.J. • Los Angeles • Nashville • Omaha • Pittsburgh • Toronto • Havana • Buenos Aires

Circle 518 on postcard, page 33

PENFLEX

• CUSHIONS SHOCK
• PREVENTS BREAKS



PENFLEX TUBING ABSORBS THERMAL EXPANSION SHOCKS

Thermal expansion 900°F . . . pressure up to 850 psi. . . . impact and pipe movement under terrific strain, but Penflex safely handles them all. That's the story of Penflex 8" I.D. stainless steel interlocked tubing welded into the pipeline, eliminating the cost of flanging the joint as well as the pipe. This was installed as an expansion joint on safety blow-off valves.

Wherever thermal expansion, pressures and shock are factors in keeping steam, air, water or chemical lines from breaking you can rely on Penflex Interlocked Tubing and Penflexweld High Pressure Tubing. Available in steel, bronze and stainless steel from ⅛" I.D. to 24" I.D. Write for complete details to Pennsylvania Flexible Metallic Tubing Company, Inc., Route 30, Paoli, Pa.

GET NEW DATA BOOK AND CATALOG

PENFLEX

TIGHT AS A PIPE BUT... FLEXIBLE

Circle 519 on postcard, page 33

BACKTALK— FORETHOUGHTS

of Scientists' and 'How Lighting Affects Heating and Air Conditioning'." *H. E. Twietmeyer, Plant Engineer, Research Laboratories, General Motors Corp., Warren, Mich.*

PLANT ENGINEERING:

"The article, 'The Care and Maintenance of Scientists' in your June issue was interesting and somewhat of a revelation but you overlooked one thing—who changes their diapers? Let's hope they are as good as they seem to think they are. The real scientists of the past must be restless in their graves." *Walter Coopey, Engineering Consultant, Charleston, W. Va.*

■ Tear sheets on this article are fast disappearing and any reader interested should get his request in to us—pronto.—*Editors.*

Pneumatic-Hydraulic Reprints

PLANT ENGINEERING:

"Enclosed is a check in the amount of $1.50 for a single copy of your 48-page reprint of the series 'How To Design Pneumatic-Hydraulic Actuation Systems.'

"Your single copies have been very helpful in assisting me in my work." *John A. Sahonchik, Design Draftsman, International Smelting and Refining Co., Perth Amboy, N. J.*

■ The reprints of this series have just become available and may be obtained for $1.50 per copy.—*Editors.*

Grounded Power Systems

PLANT ENGINEERING:

"Please send tear sheets of the article 'Evaluation of Grounded Neutral Power Systems'. The article appeared in the June issue of PLANT ENGINEERING." *J. W. Bowman, Plant Engineer, The Celanese Polymer Corp., Belvidere, N.J.*

Threadline Mortar

PLANT ENGINEERING:

"An article in the June PLANT ENGINEERING announced a new epoxy mortar, Threadline Mortar. Our research staff would like to obtain a laboratory sample of this material along with any available technical data and price lists." *H. J. Deney, Vice President Research, Pierce and Stevens Chemical Corp., Buffalo, N. Y.*

PLANT ENGINEERING:

"We would thank you to send us further information regarding the adhesive for masonry construction as referred to in June PLANT ENGINEERING.

"We are particularly interested in the type caulking gun and the solvent used in cleaning the gun. Any other information that you could furnish would be appreciated." *G. M. Magruder, General Manager, Columbia Pipe Co., Columbia, S. C.*

■ All requests for further information have been forwarded to the manufacturer of Threadline Mortar.—*Editors.*

Industrial Construction Reprints

PLANT ENGINEERING:

"Please send me one reprint copy of the special section entitled 'Industrial Construction and the Plant Engineer'." *Dale E. Carrell, Project Engineering Dept., Mead Johnson & Co., Evansville, Indiana.*

PLANT ENGINEERING:

"Please send me one reprint copy of the special section entitled 'Industrial Construction and the Plant Engineer.'

"Services of this sort are very helpful and increase the value of your publication manyfold." *Wm. Albiez, Central Engineering Dept., Continental Copper and Steel Industries, Inc., New York, N.Y.*

■ Reprints of this helpful section are still available.—*Editors.*

More Weldors

PLANT ENGINEERING:

"We would like very much to have five reprints of 'Training Maintenance Weldors—Part III', which appeared in the June issue of PLANT ENGINEERING." *S. John Oechsle, Jr., Metalweld, Inc., Philadelphia, Pa.*

PLANT ENGINEERING:

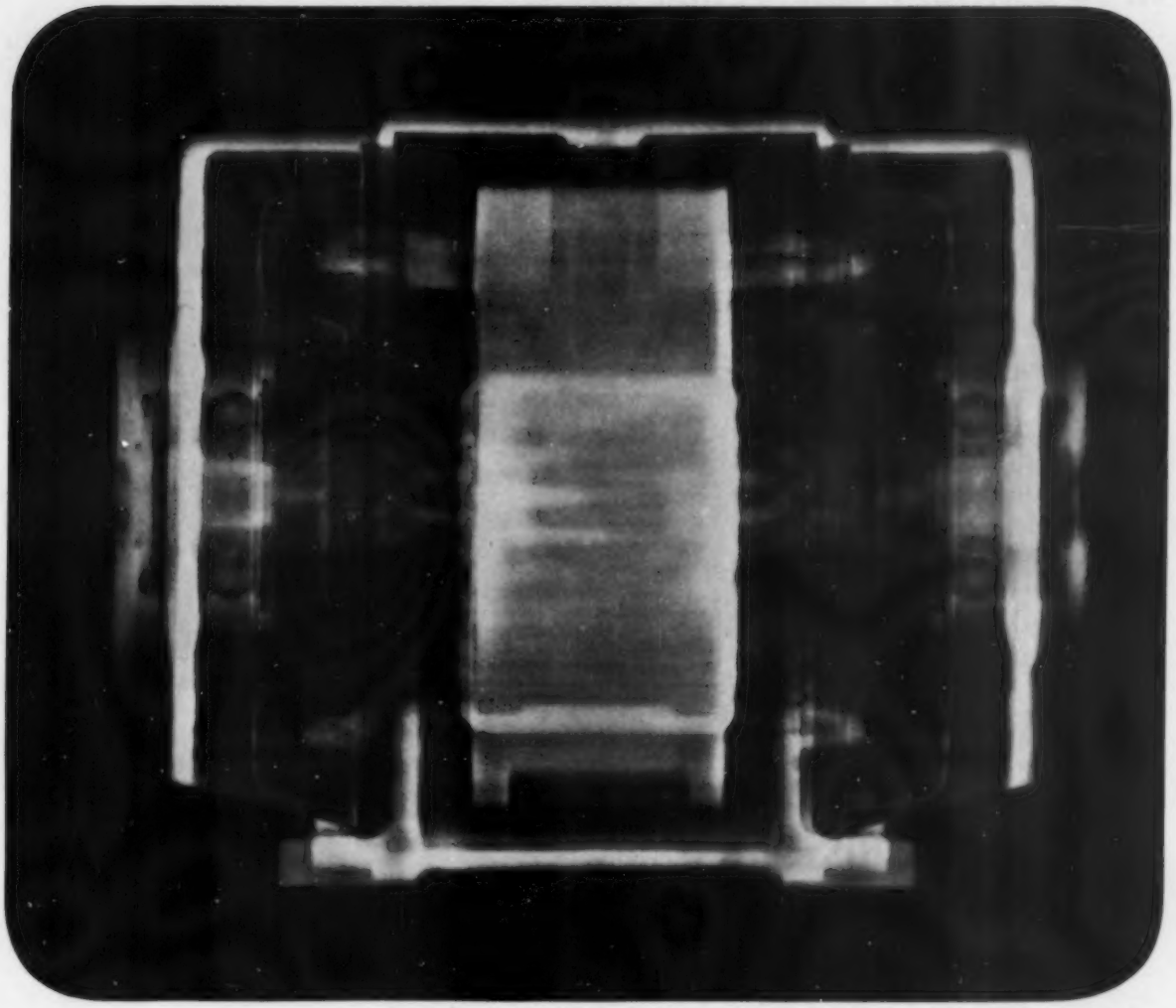
"We have had to train maintenance and tooling weldors many times since starting operations in North Carolina. Your series of articles entitled 'Training Maintenance Weldors' in April and subsequent issues of the PLANT ENGINEERING magazine are well written to help such a program.

"I would appreciate receiving tear sheets of the full series, if available, for our future use." *F. F. Willis, Tooling Manager, Douglas Aircraft Co., Inc., Charlotte, N.C.*

■ Tear sheets on parts I, II, and III are still available. When this entire series of five articles has been published, the reprint of the complete series will be available for a nominal charge. This will be announced at a later date.—*Editors.*

ALLIS-CHALMERS

A-1508



Actual radiograph of a 5-hp open-type motor taken with a 24-million volt Allis-Chalmers Betatron.

X-ray view of motor health

Invisible standards of perfection increase life expectancy of every Allis-Chalmers motor

The exceptionally long performance of A-C open motors proves the value of thinking *beyond* established standards of design . . . of taking "significant new achievement" as the ideal.

This ideal led to many refinements for A-C open motors: double-shielded bearings that keep dirt out and allow controlled migration of grease, permanently numbered leads for easy identification and connection, and heavy-duty cast iron frames that resist corrosion and keep rotating parts perfectly aligned.

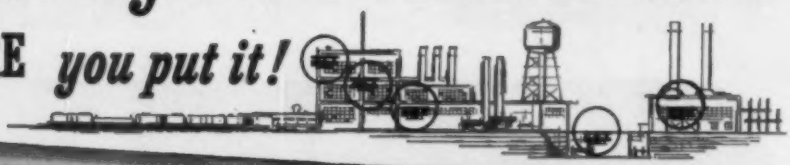
For totally-enclosed, open-type and *Super-Seal* general purpose motors, and electrically or mechanically modified definite-purpose motors, choose the motor built to invisible standards of perfection. Choose A-C. Special application help available.

Call your nearby A-C representative. Or write **Allis-Chalmers,** *Industrial Equipment Division, Milwaukee 1, Wis.* Super-Seal is an Allis-Chalmers trademark.

Circle 520 on postcard, page 33

Conspicuous by its Performance

...no matter WHERE you put it!



Clark Model CMB-2 Balanced/Opposed Air Compressor rated at 400 bhp. Models available from 75 to 8000 bhp.

CLARK Balanced/Opposed AIR COMPRESSOR

Air Power—100 lb. Variety—The kind that is economical, dependable... That's what you get with a compact Clark Balanced/Opposed Air compressor. You may hide it in the basement or the boiler room, but this smooth running veteran will always be conspicuous by its performance.

Efficiency at All Key Points—Compressor cylinders utilize large, streamlined air passages and optimum number of valves to minimize pressure drop, turbulence and valve losses. The heavy duty *Simplaire* valve has only one moving part on the low pressure suction side. Its webbed disc valve ring is opposed by minimum spring force, operates with less total differential pressure than any other compressor valve design. The Clark intercooler is carefully engineered for highest possible heat transfer rates. Double wall construction provides a large surge chamber to minimize pressure drop and assure maximum delivery of air.

A Real Space Saver—Squeeze it into "impossible" places... install large amounts of horsepower in limited areas. Compact Clark design with overhung integrally supported rotor makes the most of available space, eliminates bulky extension shafts with outboard bearings and flywheel.

Perfect Running Balance—Clark Balanced/Opposed design cancels out primary and secondary unbalanced forces. Units run smooth and quiet, thereby easing wear on moving parts. Foundations need only be large enough to support the physical weight of the compressor. You can locate a Clark machine anywhere... with confidence.

Low, Low Maintenance—Internal components are easy to get at, easy to service. Clark *Simplaire* valves are ultra simple in design, can be readily installed, or disassembled and cleaned. Valve bodies and housings of like size are completely interchangeable for suction or discharge, offer no alignment problems.

Put Greater Efficiency into every compressor dollar you spend. Contact your nearest Clark representative for full details, or write for Bulletin 185.

CLARK

DRESSER INDUSTRIES INC.

OIL • GAS • CHEMICAL
ELECTRONIC • INDUSTRIAL

CLARK BROS. CO., OLEAN, N.Y.

Circle 521 on postcard, page 33

BULLETINS

JUST RELEASED and OF IMMEDIATE PLANT INTEREST

DUST CONTROL

Automatic Dust Arresters

Design and operation details on automatic bag type dust arresters that collect dust without interruption during bag cleaning are presented in 8-pp Bulletin 164-6. Dimensions, capacities and specifications included. Buell Engineering Co., Inc.

For a copy, circle 101 on Post Card

Electrostatic Precipitators

Air pollution problems and their solution with electrostatic precipitators are discussed in 12-pp Bulletin 2128. Principles of operation, specifications and electronic controls are covered. American-Standard Industrial Div.

For a copy, circle 102 on Post Card

Electronic Air Cleaner

Principle of electronic precipitation is explained in 16-pp Bulletin 258B. Specifications, dimensional diagrams and tables of capacities included. American Air Filter Co., Inc.

For a copy, circle 103 on Post Card

PUMPS, COMPRESSORS

Rotary Pump Guide

Performance and construction details on rotary pumps designed to handle thick or thin liquids and operate efficiently in either direction are presented in this 16-pp bulletin. Dimensions given. Roper Hydraulics, Inc.

For a copy, circle 104 on Post Card

Single-Stage Chemical Pumps

Cradle-mounted chemical pumps featuring interchangeability of parts among various sizes are described in 8-pp Bulletin 70288. Dimensional data, diagrams and coverage chart are included. Ingersoll-Rand Co.

For a copy, circle 105 on Post Card

Seal-less Pumps

Design, operation and selection of canned pumps for leakproof pumping of corrosive, toxic, volatile, explosive, radioactive or other fluids is covered in Bulletin 1100-1. Fostoria Corp.

For a copy, circle 106 on Post Card

Rugged Pumps for Sewage Disposal

Vertical, enclosed-shaft, non-clog VCS pumps are described in 16-pp Bulletin 124-G. Gives simple method for determining capacities, pump and motor selection tables, layout dimensions and engineering data, optional equipment. Chicago Pump.

For a copy, circle 107 on Post Card

Compressors for All Requirements

Sixteen-pp Catalog 20 gives data on 200 models of gasoline- and electric-driven compressors for industrial and other applications. Features automatic start and stop and constant running units with horizontal or vertical tanks. Lincoln Engineering Co.

For a copy, circle 108 on Post Card

More Power Where Needed

Described in this bulletin is a portable rotary compressor powered by a 53-hp engine providing a 60 per cent power surplus at only 1600 rpm. Shows design features contributing to low maintenance. LeRoi Div., Westinghouse Air Brake Co.

For a copy, circle 109 on Post Card

PACKINGS, GASKETS

Rubber Sheet Packing

Construction details and recommended applications of natural and synthetic rubber sheet packings are covered in Bulletin PK-170A. Covers general purpose sheet, diaphragm sheet, Neoprene sheet, and Nitrile sheet styles. Johns-Manville.

For a copy, circle 111 on Post Card

Industrial Felt Reference Guide

Comparative properties of industrial felt for packings and other applications are presented in handy reference tables in this 10-pp bulletin. Lists such data as comparative price coefficients, physical and mechanical properties, chemical properties and fabrication. Continental Felt Co.

For a copy, circle 112 on Post Card

Improved Gasket Materials

Factors to consider in choosing gasket materials are outlined in 24-pp Bulletin AD-190. Includes selection tables, resistance ratings, design information. Describes characteristics of rubber sheet, compressed asbestos sheet, woven asbestos, vegetable fiber, other materials. Garlock Inc.

For a copy, circle 113 on Post Card

Spiral-Wound Gaskets

Revised 20-pp Folder AD-176 gives information on Guardian paper thin gaskets and high temperature gaskets made with ceramic filler material. Covers construction, specifications, flange face finish, bolting data, styles. Garlock, Inc.

For a copy, circle 114 on Post Card

MECHANICAL POWER TRANSMISSION

Spiral Bevel Speed Reducers

Horizontal and vertical bevel speed reducers are described in 34-pp Bulletin J-25. Gives information on basic types, features, applications, selection, overhung and thrust load capacities, standard assemblies, horsepower and thermal rating, dimensions, backstop selection, and bedplate dimensions. Hewitt-Robins.

For a copy, circle 116 on Post Card

Controlled Speed Systems

Systems of automatic speed control for specific industrial applications are described in 8-pp Form F-1952. Illustrates liquid level control, pressure control, centerwind drive, speed sensitive control, load control, position or link synchronization control, temperature control, others. U. S. Electrical Motors Inc.

For a copy, circle 117 on Post Card

For Mechanical Power Transmission

Eight-pp Bulletin 23103 describes mechanical power transmission equipment, including v-belts, variable speed and timing belt drives, flat belt pulleys, motor bases, flexible couplings, bushings, bearings, pillow blocks and related equipment. T. B. Wood's Sons Co.

For a copy, circle 118 on Post Card

V-S Belt Data Charted

Wall chart illustrates measuring, coupling and installation of variable speed belts without disassembling the enclosed drives. Manheim Mfg. & Belting Co.

For a copy, circle 119 on Post Card

Pneumatic Friction Clutch Brake

Bulletin 52300 tells production, safety and maintenance advantages of Type M-Unit, a pneumatic clutch and brake for crankshaft mounting. Provides maintenance chart and instructions. The Federal Machine and Welder Co.

For a copy, circle 120 on Post Card

Ball Bearing Pillow Blocks

Heavy duty pillow blocks with self-aligning, single row, deep-groove precision ball bearings are featured in Folder 2951. Interchangeability chart included. Link-Belt Co.

For a copy, circle 121 on Post Card

Postage-free Reader Service Cards for your convenience in ordering these bulletins are provided on pages 33-34. You may also use the post cards for ordering any literature mentioned in the ads.

Flexible Cushion Couplings

Selection data for flexible cushion couplings that absorb vibration and compensate for all combinations of shaft misalignment and end float are presented in 24-pp Bulletin 901B. Engineering drawings, horsepower ratings included. Dodge Mfg. Corp.

For a copy, circle 122 on Post Card

Roller Chain Couplings, Covers

Bulletin 10 features flexible couplings and new coupling cover. Gives advantages of the couplings, standard sizes, prices. Includes data on couplings with fixed bores and plain bores for reboring. Acme Chain Corp.

For a copy, circle 123 on Post Card

BULLETINS

(Begins on page 31)

INSTRUMENTS, CONTROLS

Temperature, Pressure Instruments
General Catalog 101N, 60-pp, covers industrial thermometers, pressures gages, temperature and pressure controllers, valves, instrument panels, strainers, air filters, air guns, radiator and steam traps. Includes capacity tables and engineering data. H. O. Trerice Co.

For a copy, circle 124 on Post Card

Pressure and Vacuum Gages
Instruments for measuring, indicating, recording and controlling pressure and vacuums involved in industrial processes are featured in 32-pp Catalog C 70-1a. Specifications and data on instrument types and control systems. Minneapolis-Honeywell Regulator Co.

For a copy, circle 125 on Post Card

Noiseless Temperature Regulator
Catalog TCV-1, 8-pp, provides engineering information and technical data on self- or pilot-operated temperature regulators. Gives ratings, dimensions, applications, operation, ranges, materials of construction. OPW-Jordan Div., Dover Corp.

For a copy, circle 126 on Post Card

Photoelectric Control Studies
Illustrated case histories of 40 photoelectric control applications in materials handling, equipment and personnel protection, production and automatic control are presented in this 80-pp handbook. Covers photoelectric detection, sorting devices, conveyor controls, cut-off control, conveyor traffic jam monitors, level controls. Cramer Controls Corp.

For a copy, circle 127 on Post Card

VALVES, FITTINGS

Air-Operated Diaphragm Valves
Described in 8-pp Bulletin 134-A are air-operated diaphragm valves for remote and automatic flow control of corrosive and non-corrosive liquids and gases. Tables of air actuator pressures for various line pressures included. Hills-McCanna Co.

For a copy, circle 128 on Post Card

Nonleaking, Nonfreezing Valves
Sixteen-pp catalog details specifications and characteristics of Flo-Ball valves. Includes materials of construction charts, pressure/temperature curves, dimension tables, drawings. Hydromatics, Inc.

For a copy, circle 129 on Post Card

Versatile Breather Valves
Three-in-one breather valves offering a choice of diaphragm, air cushion or metal-to-metal pallet design are featured in 12-pp Bulletin CP2701. Design data and leakage and flow curves. The Vapor Recovery Systems Co.

For a copy, circle 130 on Post Card

High-Vacuum Equipment
Valves, baffles and traps designed for high-vacuum applications are featured in 28-pp Bulletin 10-1. Design and construction details are illustrated and selection tables are included. Consolidated Vacuum Corp.

For a copy, circle 131 on Post Card

Split-Body Control Valve
Bulletin LB4 describes construction and operation of the split-body LB valve and its maintenance-saving features. Tells how it gives spare parts savings, tight shutoff and versatility. Specifications, ordering information included. Conoflow Corp.

For a copy, circle 132 on Post Card

Relief Unloading Valve
Bulletin S-5 describes an automatic relief-unloading valve for steam, air, gas and fluid control service, providing selection data and engineering specifications. Golden-Anderson Valve Specialty Co.

For a copy, circle 133 on Post Card

Flexible Flange Coupling Adapters
Twelve-pp Catalog 1255 gives detailed information on how these fittings can be incorporated into design of water, sewage, or gas systems or used for "cutting-in" flanged fitting installation in existing pipelines. Smith-Blair, Inc.

For a copy, circle 134 on Post Card

Connecting, Sealing Methods
Eight-pp Bulletin WB-1, "How, When and Why To Use a V-Band Coupling" explains how fastening of coupling can improve design, appearance, cut assembly time and costs. Coupling and flange configurations are illustrated, sealing principle explained and uses shown. Aeroquip Corp.

For a copy, circle 135 on Post Card

Self-Sealing Couplings
Applications of self-sealing couplings in fluid piping systems are discussed in illustrated 20-pp Bulletin 629. Advantages in such applications as testing machines or hydraulic systems, connecting tools and other attachments, replacement of two-way shutoff valves told. Aeroquip Corp.

For a copy, circle 136 on Post Card

FANS, VENTILATING

Industrial Centrifugal Fans
Operating features, construction details and engineering data on airfoil centrifugal fans for heavy duty applications are presented in Catalog 1122. Westinghouse Electric Corp.

For a copy, circle 138 on Post Card

Blowers and Exhausters
Cast iron and fabricated steel blowers and exhausters for standard and special applications are illustrated and described in this 16-pp bulletin. Technical section includes formulae, friction loss charts. Lamson Corp.

For a copy, circle 139 on Post Card

Straight Line Diffuser
Catalog ASL-70, 8-pp, contains application and selection data on the ASL (architectural straight line) air diffuser. Provides performance tables on continuous wall-to-wall, ceiling-mounted or wall-mounted diffusers. Six installation steps are given. Anemostat Corp. of America.

For a copy, circle 140 on Post Card

Underground Ventilating Heaters
Principle of operation and specifications on ventilating heaters for use in ventilating underground areas are presented in this product bulletin. Morrison-Pelsue Co.

For a copy, circle 141 on Post Card

MATERIALS HANDLING

Battery-Powered Trucks
Construction and operating characteristics of battery electric industrial trucks are outlined in this 18-pp bulletin. Lists advantages based on survey of typical users. Electric Industrial Truck and Allied Products Manufacturers.

For a copy, circle 142 on Post Card

To Buy Trucks—or Rent Them
Lease and rental finance plans for automatic lift trucks are outlined in 12-pp booklet Form 2005. Discusses the why and when of leasing, common leasing problems, various lease plans available. Automatic Transportation Co.

For a copy, circle 143 on Post Card

Floor Trucks and Dollies
Catalog 58A, 28pp, illustrates and specifies 130 models of two-wheel trucks and dollies. Includes capacities, dimensions, ordering tips. Nutting Truck and Caster Co.

For a copy, circle 144 on Post Card

Clamp Trucks for Easier Handling
Construction, specifications, applications of various models of clamp trucks are given in 8-pp bulletin. Covers empty box vertical type, prong nose truck, portable conveyor. Food Machinery and Chemical Corp.

For a copy, circle 145 on Post Card

Guide to Powered Conveyors
Comprehensive design and engineering data on powered conveyors is presented in this 88-pp reference handbook. Includes section dealing with design theory and engineering calculations, as well as sections on standard arrangements, engineering data and applications. Lamson Corp.

For a copy, circle 146 on Post Card

Versatile Steel Conveyor
Features of steel belt conveyors are described in an 8-pp brochure "All-Round Use." Illustrates a broad range of applications. Resistance to temperature, taste, odor, and ease of cleaning covered. Sandvik Steel, Inc.

For a copy, circle 147 on Post Card

Steel Conveyor Belting
Flat-top steel conveyor belting that provides a moving sidewalk for handling of materials without plant traffic interruption is featured in Bulletin MF-300. Specifications included. May-Fran Mfg. Co.

For a copy, circle 148 on Post Card

(More Bulletins on page 199)

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Maintenance and Steam Traps

. . . there's a relationship that goes far beyond trap maintenance alone

Good traps and good trapping have a greater effect on your maintenance costs than does trap maintenance itself. By that we mean that the right traps, properly selected and installed, and with the benefits of a preventive maintenance program, will save far more maintenance dollars than they will cost.

Under the pressure of spiralling maintenance costs, this thought becomes mighty important. Let's take a look at what it involves:

Proper Selection of Steam Traps

1. Be sure it's the right type of trap.

2. Be sure it's sized right and is for the correct operating pressure.

3. Be sure it's first rate in design and construction.

Proper Installation of Steam Traps

1. Install them so they are accessible for inspection and maintenance.

2. Install a test valve.

3. Use a union or unions.

4. Use a shutoff valve or valves.

5. Use a strainer ahead of the trap if dirt conditions are bad.

6. Use a by-pass only where continuity of service is imperative.

7. Standardize inlet and outlet connections.

Preventive Maintenance Program

1. Test trap regularly for proper operation. (Trap size, operating pressure and importance determine frequency.)

2. Inspect internal mechanism at least once a year.

You Get Indirect Benefits As Well

The direct benefits of the plan outlined are pretty obvious — good traps, properly selected, require less maintenance . . . testing and inspection prevents troubles that lead to maintenance.

However, this plan provides indirect benefits which reduce maintenance in other parts of the plant as well:

Good traps save steam and reduce the load (and consequently maintenance) on fuel handling and burning equipment and on ash handling equipment.

Good traps protect the system by eliminating water hammer and preventing the damage it can do.

Good traps discharge carbon dioxide before it can go into solution to form corrosive carbonic acid —less corrosion, less maintenance.

Good traps increase production to reduce the length of time equipment must operate or reduce the amount of equipment needed . . . either way maintenance is reduced.

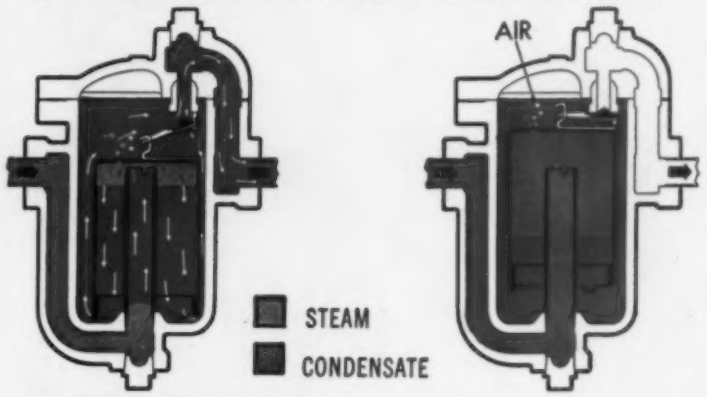
How to Go About It (The Sales Pitch)

We admit we're prejudiced, but we don't think there is any better way to select steam traps than with the help of the 44 page Armstrong Steam Trap Book. Here in a single source is specific data on the selection and sizing of traps, how to install them for best results, and how to maintain them most economically.

The Steam Trap Book will also give you full information on the design and construction of Armstrong Inverted Bucket Steam Traps that offer these important maintenance-reducing advantages:

1. Armstrong Traps are dependable.

HERE'S THE STEAM TRAP DESIGN THAT CAN REDUCE YOUR MAINTENANCE PROBLEMS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

2. Armstrong Traps require no adjustments — go from full load to zero load automatically.

3. Armstrong Traps are self-scrubbing—ordinary dirt conditions can't hurt them.

4. Armstrong Traps have long-life parts — valve and seat are heat treated chrome steel — lever assembly and bucket are stainless steel.

5. Armstrong Traps have water sealed valves to minimize wire drawing and erosion.

Ask for your copy of the Steam Trap Book—there is no obligation. Then test Armstrong Trapping. If you are not completely satisfied with the results, you can return the traps for a full refund of the purchase price. You can't lose much that way. Call your local Armstrong Representative or Distributor, or write

Armstrong Machine Works
9126 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

See our Catalog in Sweet's Plant Engineering File

Circle 522 on postcard, page 33

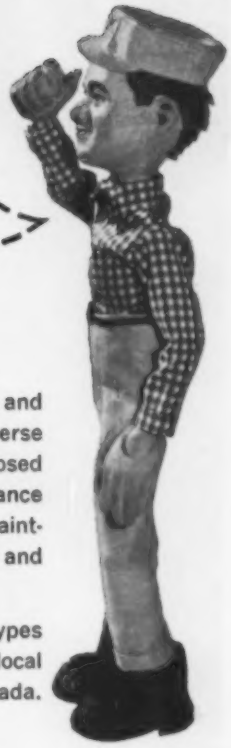
*** KILLARK ENTRANCE ELBOWS**

Shown above is 6" size. Twelve other sizes down to ½". Cast from copper-free aluminum in a variety of styles. Flanged cover overlaps gasket and edge of fitting making elbows waterproof. Sizes from 2" up have cast aluminum cover. Service ells with weep holes and with grounding hubs for grounding rods can be furnished. Fast delivery from complete stocks.

*** KILLARK SERVICE ENTRANCE HEADS**

Shown above is 6" style. Complete line includes 30 sizes from ½" to 6" in threaded or slip-on styles. Copper-free aluminum castings will never rust, never stain building walls and are corrosion resistant. Special reversible feature allows use at end of horizontal conduit or at top of vertical conduit. Complete with high-quality composition insulator with number of holes required. Designed for easier handling of stiff, heavy cable. Fast delivery from complete stocks.

"Copper free aluminum construction gives Killark fittings bonus life"



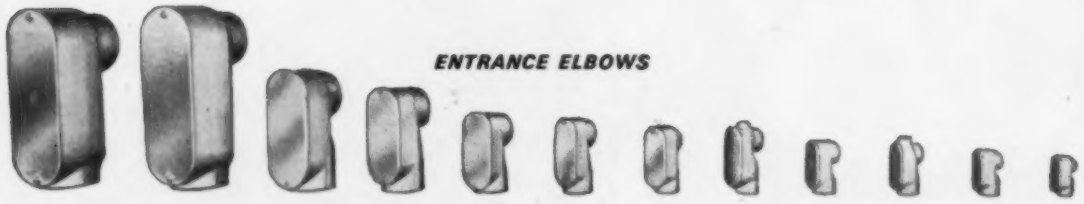
Because they are cast only from copper-free aluminum, Killark electrical fittings and fixtures provide dependable service for longer periods, particularly under adverse conditions. For example, they remain permanently rust-proof in weather-exposed locations and will never stain building exteriors. They also provide better resistance to various types of corrosion and can be used in many specialized applications. Painting and similar protective measures are never required. Specify Killark fittings and fixtures on your next job—and get the "bonus life" advantages of aluminum.

Killark entrance heads and entrance elbows, along with 7500 other sizes and types of fittings are carried in stock for immediate delivery . . . available from your local distributor or Killark warehouse stocks in 18 cities in the United States and Canada.

THREADED SERVICE ENTRANCE HEADS

SLIP-ON SERVICE ENTRANCE HEADS

ENTRANCE ELBOWS



Killark

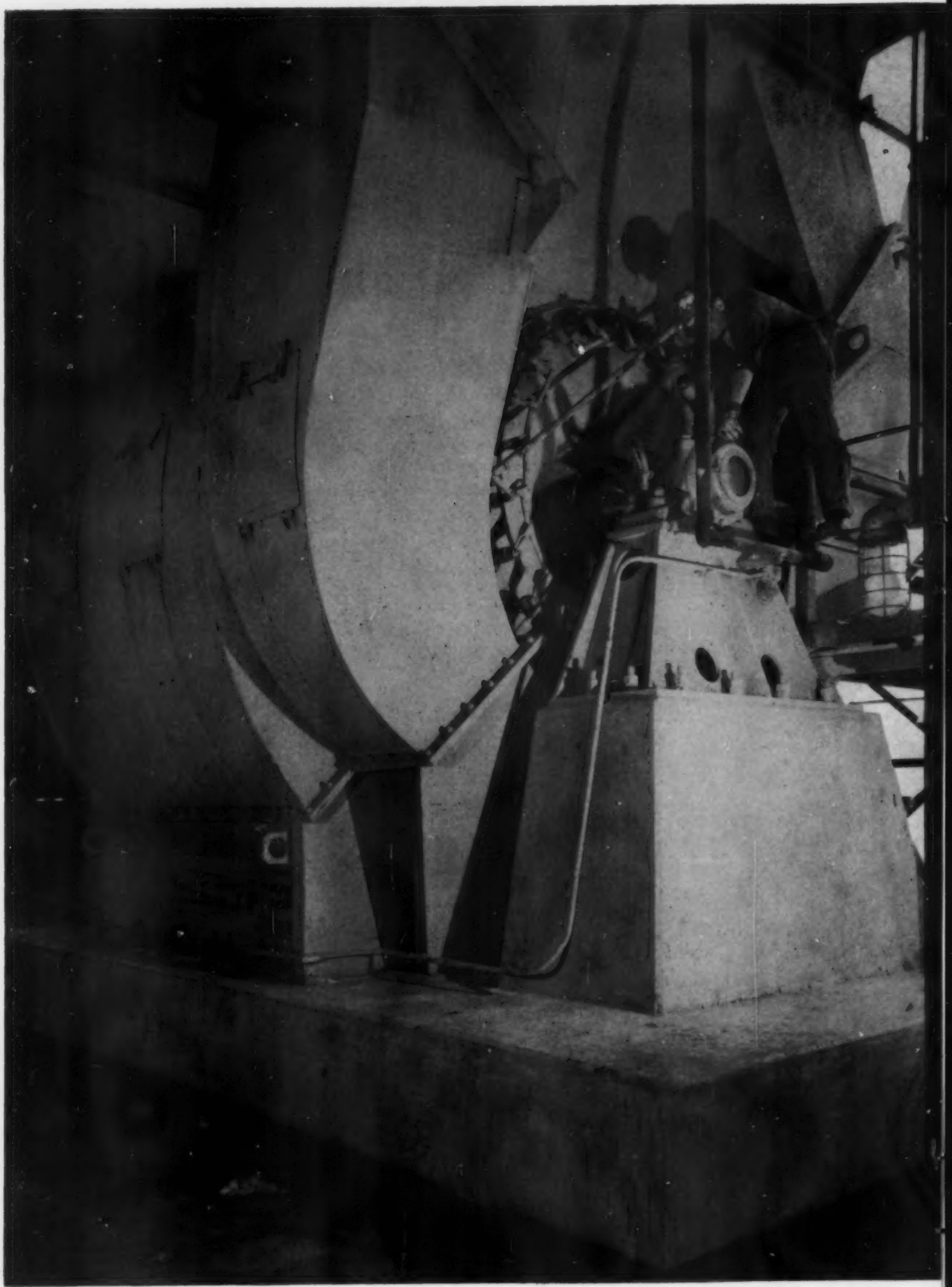
Write for Killark Catalog

ELECTRIC MANUFACTURING COMPANY

Vandeventer and Easton Ave. • St. Louis 13, Missouri

In Canada: Killark Electric of Canada, Ltd., 421 Islington Ave. South, Toronto 18, Ont.

Circle 533 on postcard, page 33



RD Fan used for induced draft on basic oxygen furnace of large steel producer. There are four identical units, each producing 325,000 cfm against a static pressure of 15" wg at 550° F.

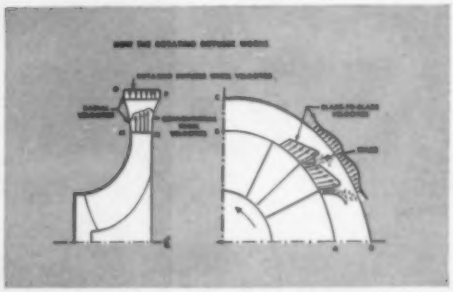
JOY RD FANS CAN PROVIDE PRESSURES UP TO 4.5 PSI AND CAPACITIES UP TO 600,000 CFM

Joy RD Centrifugal Fans, based on a new concept in fan design, can provide any volume of air or gas at pressures up to 4.5 psi in a single stage. This means important savings in initial cost. An equally important saving is their high efficiency over a wide range of volume, which is especially important where load fluctuates. Surging, even on parallel operation, is no problem because the RD Fan is inherently resistant to pressure surge over its entire duty range.

These advantages of the RD Fan are the results of its unique rotating diffuser. Instead of stationary diffusers, the RD diffuser is an integral part of the wheel—added at the blade tips. The rotating diffuser reduces the gas velocity before leaving the wheel and up to 98% of the conversion of velocity to pressure is accomplished with the wheel of the RD Fan.

Radial blades in the RD Fan tend to be self cleaning, even when handling dust laden and dirty gases. The rotating diffuser results in low noise levels because of the lower and more regular velocities leaving the wheel and because the blade tips are remote from the cut-off.

The Joy RD Fan is finding steady acceptance in induced draft and forced draft applications in the steel and power industries, in handling chemical process gases, and in heavy duty industrial applications. For extremely dirty or corrosive applications the entire unit may be fabricated of stainless steel. Parts are simple because there are no large castings or close running tolerances. For complete information and duty areas of the RD Fan, write for bulletin 3449-15.

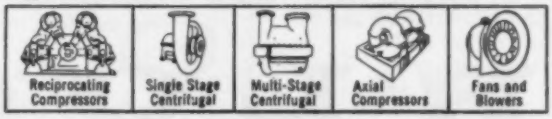


HOW THE ROTATING DIFFUSER WORKS

Studies have shown that radial velocities leaving conventional wheels are unequally distributed, as shown in MN. Also there is fluctuation in the blade-to-blade velocities based on $\frac{nN}{60}$ where n is the number of blades and N is the speed in rpm. The Rotating Diffuser reduces the gas velocity before leaving the wheel, which allows more uniform flow as shown at OP and CD. Without the rotating diffuser, velocities are much higher and erratic as shown at AB and MN, causing turbulence, friction losses.

Joy RD Fan at eastern CO_2 plant. Unit has capacity of 27,800 cfm, at 3 psi. Drive is a 450 hp steam turbine.

AIR MOVING EQUIPMENT FOR ALL INDUSTRY



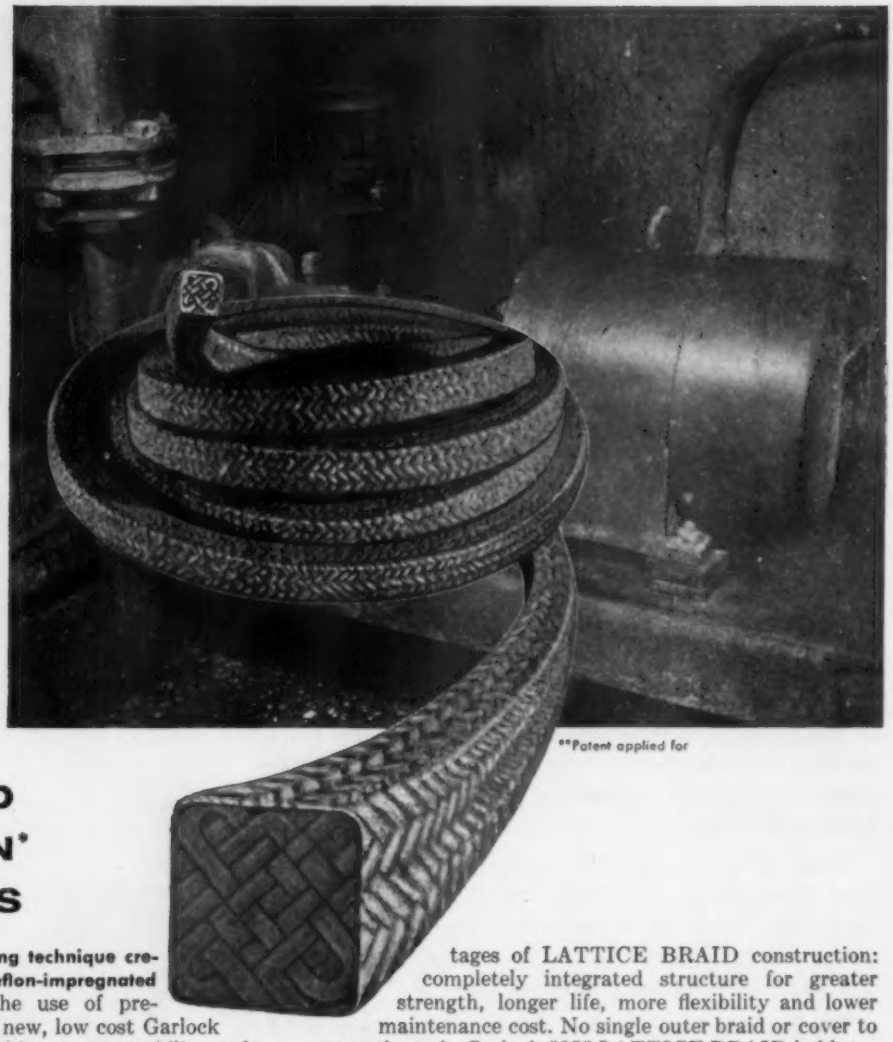
JOY

Joy Manufacturing Company
Oliver Building, Pittsburgh 22, Pa.

In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario

Circle 524 on postcard, page 33

Apply Garlock 5875 Teflon-impregnated LATTICE BRAID Packings to centrifugal and rotary pump shafts, valve stems and expansion joints, and reciprocating rods, rams, and plungers . . . a premium packing at regular packing prices.**



**Patent applied for

ENGINEERED TEFLON* PRODUCTS

Exclusive Garlock manufacturing technique creates unique properties in Teflon-impregnated LATTICE BRAID Packings. The use of pre-sintered Teflon powder gives new, low cost Garlock 5875 LATTICE BRAID† Packing greater stability under temperature changes and outstanding resistance to glazing. The pre-sintered Teflon powder on the white asbestos yarn does not absorb water; hence, there is no "wicking" action, and minimum axial swell. The ground particles of Teflon form millions of bearing points on the packing surface . . . effectively reduce friction and wear . . . once installed, retightening or adjustments are rarely, if ever, necessary. Garlock 5875 LATTICE BRAID Packing contains over 30% Teflon by actual weight—affords excellent resistance to moderately destructive and corrosive acids and caustics from −90°F to +500°F.

Costs no more than regular packing. Garlock 5875 LATTICE BRAID Packing sells for almost 40% less than other Teflon packings in use today. At this price, you can enjoy all the new features of 5875 plus the advantages of LATTICE BRAID construction: completely integrated structure for greater strength, longer life, more flexibility and lower maintenance cost. No single outer braid or cover to wear through. Garlock 5875 LATTICE BRAID holds together without disintegrating, wears far beyond ordinary packings.

Enjoy fast delivery from warehouse stock. Garlock 5875 Packing is immediately available in sizes from ¼" through 1" in either spool or reel form to meet your specific needs. Call your local Garlock representative at the nearest of the 26 Garlock sales offices and warehouses throughout the U. S. and Canada. Or, write for Catalog AD-185, Garlock Inc., Palmyra, New York.

Canadian Div.: Garlock of Canada Ltd. **Plastics Div.:** United States Gasket Company. **Order from the complete line** of quality Garlock products . . . Packings, Gaskets, Seals, Molded and Extruded Rubber, Plastic Stock and Parts.

*DuPont Trademark for TFE Fluorocarbon Resin †Registered Trademark

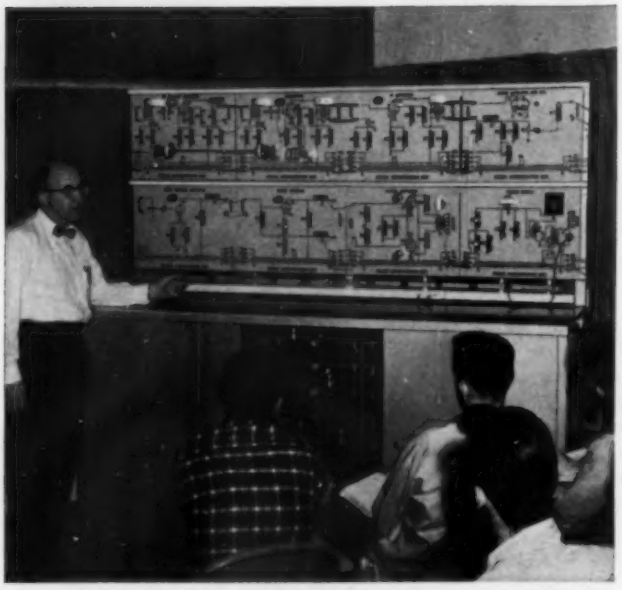
GARLOCK

Circle 525 on postcard, page 33

How to set up an ELECTRONICS MAINTENANCE TRAINING PROGRAM

for your automatic control system

One training program conducted in your plant or facility can meet all your electronics maintenance training needs . . . regardless of how many makes and types of equipment you have installed!



Philco Electronics Demonstration Unit presents the circuits of electronics equipment and systems a step at a time for easy-learning. Basic circuits are presented individually on separate "building block" panels. These are then combined on the racks of the Demonstration Unit to build complete and operating systems. Anything from a simple communications system to a complex electronic computer can be taught with this step-by-step method.

One training program tailored to your specific automatic control system is all you need to train your own electronics maintenance organization . . . and courses can be conducted in your own plant or facility. Your own personnel can be trained to conduct the courses, so you have an electronics maintenance training capability within your company for all future needs.

Your training program can be prepared and set up in a minimum of time by training specialists from Philco TechRep Division, regardless of the makes and types of equipment involved. This specialized technical training organization has been developing and conducting electronics training programs since the early days of World War II. During these two decades, effective technical training methods, materials, and teaching aids have been developed and perfected . . . and are currently in use in all 50 states and at least 25 foreign countries.

If you have a need for electronics maintenance training, Philco TechRep Division has the experienced personnel and/or the teaching aids and materials to meet it. Use the reader's service card for brochure describing our training capabilities, or write for more detailed information relative to your specific need.

PHILCO®

Famous for Quality the World Over

For further information, please write:

PHILCO TECHREP DIVISION, P. O. BOX 4730, PHILADELPHIA 34, PA., U.S.A.
P. O. BOX 10150, PALO ALTO, CALIFORNIA, U.S.A.

IN EUROPE:
TechRep Services S.A.,
Avenue de Beauregard 3,
Fribourg, Switzerland

IN CANADA:
Philco Corporation of Canada, Ltd.,
Don Mills Road, Don Mills,
Toronto, Ontario, Canada

Circle 526 on postcard, page 33

PLANT ENGINEERS' DIGEST®—so those who rush may read and know what's new

Edited by Bea Berghorn

Optical Checking of Salt Bath Controls Simplified by Original Device

PROVING both accurate and effective, this simple device was adapted to facilitate optical checking of automatically-controlled salt bath temperature.

Used regularly by Geometric Tool Co., Div. United-Greenfield Corp., New Haven, Conn., to make rapid temperature check on salt bath equipment operating at 2300 F, the device consists of two ⅜-in. thick steel plates welded edge to edge to form a 135-deg angle. Placed on top of the furnace with the angled portion facing the pot, this serves as a mounting table for a 1¼-in. diameter stainless steel tube. The tube is 11½ in. long and is extended into the molten salt through a hole in the angled plate. A ferrule or collet attached to one end of the tube with a set screw positions it. The tube is made by drilling a longitudinal hole partially through a cylindrical piece of stainless to within ½ in. of the end that goes into the furnace.

When the tube has been brought up to temperature by the bath, an optical pyrometer is sighted through the tube on its undrilled bottom portion and the bath temperature verified.

The temperature is safely and conveniently checked as the angled portion of the plate holding the tube shields the operator from radiated bath furnace heat.

Should any part of an automatic system fail, this optical system registers the failure. In a salt bath operating at 2300 F it measures the temperature to within plus or minus 5 deg. *From Salt Bath Tips and Trends, published by Ajax Electric Co., Philadelphia, Pa.*

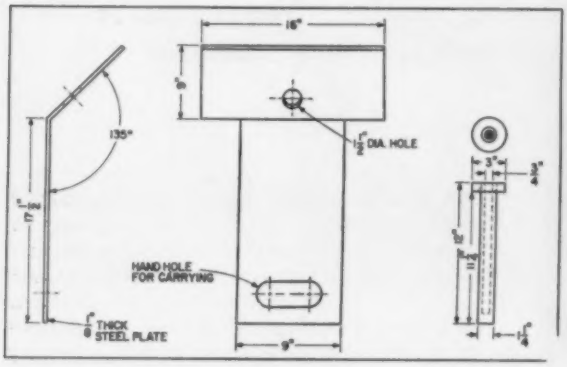


Diagram showing details for checking salt bath controls.

Plate shields workman from heat as he checks controls.

Fiber Trays Adapt to Stacking

INCREASED production often creates materials handling problems, as it did at Small Air Circuit Breaker Div. of I-T-E Circuit Breaker Co., Philadelphia, Pa. A great number of containers were needed to carry parts through various preparatory operations and for storage.

Nesting-stacking trays are filled automatically from the slope-top pedestal.

This was solved by introducing vulcanized fiber nesting-stacking trays, in place of the metal containers previously used, which were too heavy for women employees, and wooden boxes, which required constant repair and could not be stacked.

Selected as standard materials handling containers, these nesting-stacking trays are equipped with sturdy stacking rods which permit a large number of filled trays to be stacked up without danger of collapse or sway. Nesting stops at the sides make it easy to stack empty trays vertically in order to save storage space. The trays also have hardwood runners which add rigidity and act as guides for skate wheel conveyors.

Since the trays are a standard size, their contents can be accurately estimated. Their fiber construction also helps cut maintenance and replacement costs for trays and keep down accidental damage to parts. *From a release of National Vulcanized Fibre Co., Wilmington, Del.*

All Plastic and an Acre Wide!

FABRICATED in a single piece, the largest sheet of polyvinyl plastic material ever used for industrial purposes has been installed as the watertight lining in a surge pond at Bagdad Copper Corp., Bagdad, Ariz.

The flexible plastic lining is being used to hold a dilute solution of sulfuric acid, copper sulfate, and water used in copper mining and recovery operations. It was fabricated and installed at a cost about $24,000 under that for other methods of reservoir construction.

The surge pond, or reservoir, is one

CROUSE-HINDS

ARK-trol®

ELECTRICAL CONNECTORS

deliver normal operation . . . under abnormally severe conditions!

Very little can impair the reliability of an ARK-trol Connector . . . short of malicious mischief. Even that takes some doing!

Basic aluminum alloy components of the ARK-trol are high strength impact extrusions . . . anodic coated to resist corrosion . . . tough enough to withstand vibrations up to 20G's, or shocks up to 50G's without impairment of performance. Temperature limits range from −65°F. to +350°F. constant. **And,** in addition, ARK-trol is circuit-breaking under full load.

NEMA Ratings for other environmental factors:

CLASS	DEFINITION	CONDITION
1 & 12	Industrial Use	Excludes dust, lint, fibres, flyings, oil or coolant seepage.
2	Moisture Resistant	Materials are unaffected by condensation.
3 & 3R	Raintight & Splashproof	Outdoor areas.
4	Watertight	Excludes water by hose spray or impingement.
5 & 13	Dust-Tight	Excludes dust, but performs normally if dust is accidently enclosed during disconnect.
6	Submersible	Performs normally when submerged in water.

ARK-trol Electrical Connectors are U.L. listed and conform to J.I.C. Standard.

REDUCED SIZE and WEIGHT: PLUG and RECEPTACLE			
SIZES	RATINGS	WEIGHT	DIMENSIONS
017	20-30 Amps.	16 oz.	7 3/8" long x 1.630" dia.
021	20-30 Amps.	20 oz.	7 3/8" long x 1.630" dia.
033	30-100 Amps.	40 oz.	9 7/8" long x 2.685" dia.
041	100-200 Amps.	65 oz.	10 3/8" long x 3.190" dia.

INSERT and CONTACT FEATURES

- **Interiors are reversible and interchangeable.**
- **Four alternate polarizations (5 total).**
- **Available with or without provision for grounding.**
- **Contacts are removable.**
- **Crimp, solder or pressure terminations.**
- **One to 100 contact possibilities.**
- **Contact sizes: 16, 12, 10, 4, 1/0, and 4/0.**
- **Three types of cord grip: standard, mechanical and wire mesh.**

Write for Bulletin 2711 containing complete descriptions, specifications and configuration patterns.

CROUSE HINDS

REG. U.S. PAT. OFF.

Syracuse, New York USA

OFFICES: Albany Atlanta Baton Rouge Birmingham Boston Buffalo Charlotte Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. St. Louis St. Paul Salt Lake City San Francisco Seattle Tampa Tulsa Washington

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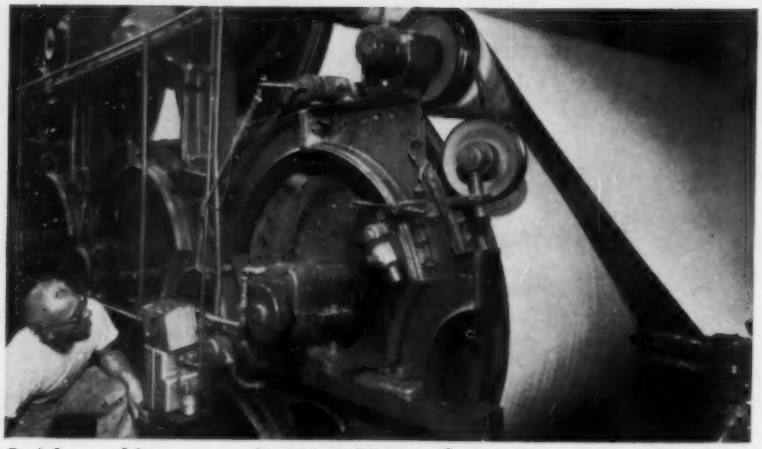
Circle 527 on postcard, page 33

at MARATHON A Division of American Can Company

ONLY 0.75 ppm HAGAFILM® HELPS REDUCE STEAM COSTS, TRAP AND PIPE MAINTENANCE



Quick case history—reading time 75 seconds

THE PLANT: The Menasha, Wisconsin, plant of Marathon Paper Company contains two veteran paper machines that have been rolling out paper for bread wrapping for over forty years. Plant personnel were on the lookout for methods of achieving production economies and reduced maintenance costs.

THE PROBLEM: Heat transfer rate at the dryer rolls could be improved, steam trap clogging and pipe maintenance due to corrosion added to overall costs.

THE SOLUTION: Constant improvement in operating procedures, modification of equipment and the use of Hagafilm achieved the desired results. Hagafilm forms a non-wettable film that not only protects all surfaces it contacts, but also cleans out old deposits.

RESULTS: Steam demand fell from 300,000 to 286,000 pounds a day which represents a substantial saving. Steam trap clogging and pipe maintenance due to corrosion decreased materially—another saving. And, there has been no trouble with sticking valves.

FOR MORE INFORMATION on how Hagafilm can help you reduce corrosion costs in steam condensate systems, write or phone for Bulletin 410-12-7.

HAGAN
CHEMICALS & CONTROLS, INC.
HAGAN CENTER, PITTSBURGH 30, PA.

HAGAN DIVISIONS: CALGON CO. • HALL LABORATORIES • BRUNER CORP.

Circle 528 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 42)

of the important units in copper mining and recovery and must be completely watertight to prevent copper loss through seepage.

Covering 36,500 sq ft—nearly one acre—the huge sheet was fabricated to exact reservoir size, with electronically welded seams that are stronger than the material itself. It was accordion-folded in two directions for shipment in one crate.

Total installation time for the lining was about four hours, a saving of time over other lining methods. The sheet was laid in a narrow strip

Believed to be the largest sheet of plastic ever formed into one piece, this lining holds 1,400,000 gallons.

down the middle length of the reservoir. Then 12 men, spaced about 20 ft apart, picked up the outside edge of the material, first on one side then on the other and walked to the side of the reservoir excavation, spreading the lining to its full width.

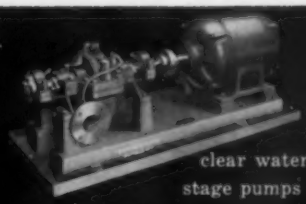
Made of Koroseal aluminum-coated plastic, impervious to most chemicals and mildew resistant, the installation is expected to last indefinitely with proper care. *From a release of B. F. Goodrich, Akron, Ohio.*

Calcium Silicate Block Insulates and Supports

A BLOCK-TYPE calcium silicate product proved to be a successful and economical insulation for the unusually broad surfaces of special processing equipment at the Lehigh Portland Cement Co.'s Foglesville, Pa. plant.

An easy-to-cut-and-handle insulation material, KaytherM, was used

Clear Water Pumps—Double suction pumps designed for utmost efficiency in clear water service. Ruggedly built for dependability, minimum maintenance and down time. Send for Bulletin 955.



High Pressure Pumps—Ideal for boiler feed and other severe clear water service. These multi-stage pumps operate against heads to 1500 ft. Capacities to 900 gpm. For complete facts, write for Bulletin 980.

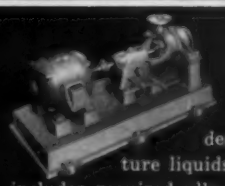
Close-Coupled Pumps—These efficient pumps save space, simplify installation. No need for shaft alignment. Vertical or horizontal models. Adjustable discharge angle. Write for Bulletin 975.

NEW! 'Buffalo' Hermetic Pumps—Quality pumps with special bearings for use where leakage would be dangerous or costly. Available in a broad range of materials of construction. Write for full details.

Non-Clogging Pumps—Move high consistency liquids dependably and efficiently. Minimize wear and wedging. Inspection simplified by diagonally split shell. Rubber-lined models for moving abrasive or corrosive liquids. Send for Bulletin 953.

Chemical Liquid Pumps—Specially designed for moving most corrosive abrasive or high consistency liquids. Your choice of many types in a variety of trim. Will withstand punishing conditions. Write for Bulletin 976.

GPL*



Heat Transfer Pumps—These special 'Buffalo' Pumps are designed to handle high temperature liquids. Job-engineered construction includes required alloys, water-cooled bearings and proper packings. Single suction, solid shell design gives peak efficiency. Write for complete details.

*** True long-range pump economy depends on GPL (Gallons Per Lifetime)...pumped day-in-and-day-out with a minimum of down-time and maintenance costs. This is the kind of long-lived reliability built into every 'Buffalo' Pump. It is the most important result of top quality design and construction.**

'Buffalo' offers a complete line of centrifugal pumps featuring parts interchangeability and low maintenance. Whatever your liquid moving needs, chances are there's a 'Buffalo' Pump to fit it perfectly. And your 'Buffalo' resident engineer is the man to recommend it. Contact him, or write us direct.

"Buffalo" PUMPS

BUFFALO PUMPS DIVISION

BUFFALO FORGE COMPANY

Buffalo, New York

Canada Pumps Ltd., Kitchener, Ontario

'Buffalo' Air Handling Equipment to move, heat, cool, dehumidify and clean air and other gases.

'Buffalo' Machine Tools to drill, punch, shear, bend, slit, notch and cope for production or plant maintenance.

'Buffalo' Centrifugal Pumps to handle most liquids and slurries under a variety of conditions.

Squier Machinery to process sugar cane, coffee and rice. Special processing machinery for chemicals.

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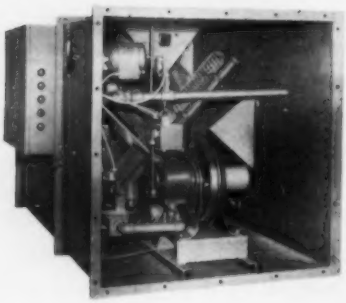
Hartzell can supply the *AIR INTAKE UNIT* that meets your exact requirements



Hartzell intake units are assembled to your order from standard components. You get, and pay for, only the elements you need. Filters and filter house—shutters—outlet diffusers . . . can all be included if you need them, omitted if you don't. Fans and control systems for all operating requirements are readily available. Gas-fired (shown) capacities from 15,000 to 90,000 CFM; steam fired from 4,000 to 36,000 CFM.

For complete details, just give your nearby Hartzell field engineer a call. You'll find him listed in the Yellow Pages or in the Hartzell catalog in Sweet's Plant Engineering and Industrial Construction Files.

Hartzell PROPELLER FAN COMPANY
Division of Castle Hills Corp. • PIQUA, OHIO
A Member of AMCA

Circle 530 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 42)

for four 60-ft-high precipitator units. These units remove dust electrostatically from gases that come from the kilns. Without insulation, the atmospheric moisture would condense on the inner walls of the precipitators, and impede the flow of collected dust from the hoppers.

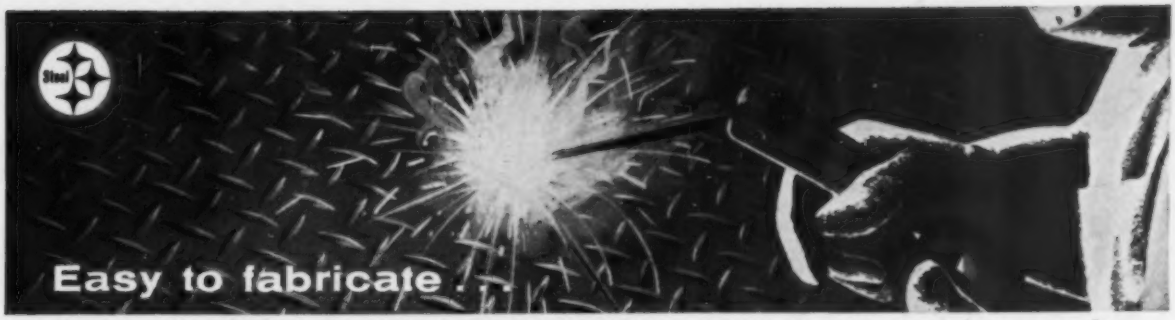
Road mesh was welded, at various points, to the stiffening angles on the

Precipitators, 60-ft high, presented unusually large insulating surfaces.

Block insulation proved to be both economical and easy to cut and fit.

surface of the precipitators. The insulating material, in blocks 12 in. by 36 in. by 6 in., cut to fit as required, were then wired to the mesh or fastened with pins and speed clips. Hexagonal wire mesh was fastened over the insulation surface, over which an application of finishing cement was troweled.

For a walking surface on the roof, a base of the blocks was laid down on top of the precipitators. Over this was poured a 1-in. mixture of almost dry vermiculite and portland

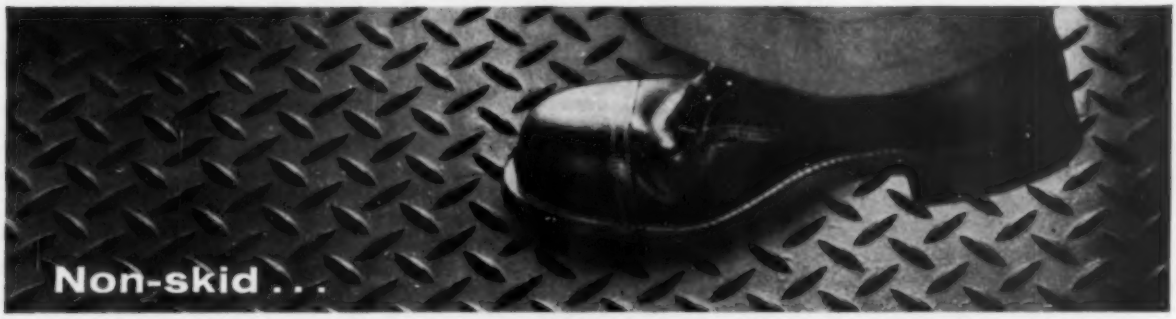


Shear, form or weld A.W. Super Diamond with standard shop equipment. Pattern matches any angle.

SUPER DIAMOND

Sweep, hose or mop A.W. Super Diamond. Water drains off in all directions. No pockets to hold dirt.

FLOOR PLATE



Reduces slides and slips. Super Diamond puts safe footing on steps, ramps, aisles; aids traction even if wet.

Write for Bulletin SD-83

ALAN WOOD STEEL COMPANY

Conshohocken, Pa. • STEEL PRODUCERS WITH THE CUSTOMER IN MIND

DISTRICT OFFICES AND REPRESENTATIVES: Philadelphia • New York • Los Angeles • Boston • Atlanta Cincinnati • Cleveland • Detroit • Houston • Pittsburgh • Richmond • St. Paul • San Francisco • Seattle Montreal, Toronto and Vancouver, Canada: A. C. Leslie & Co., Ltd.

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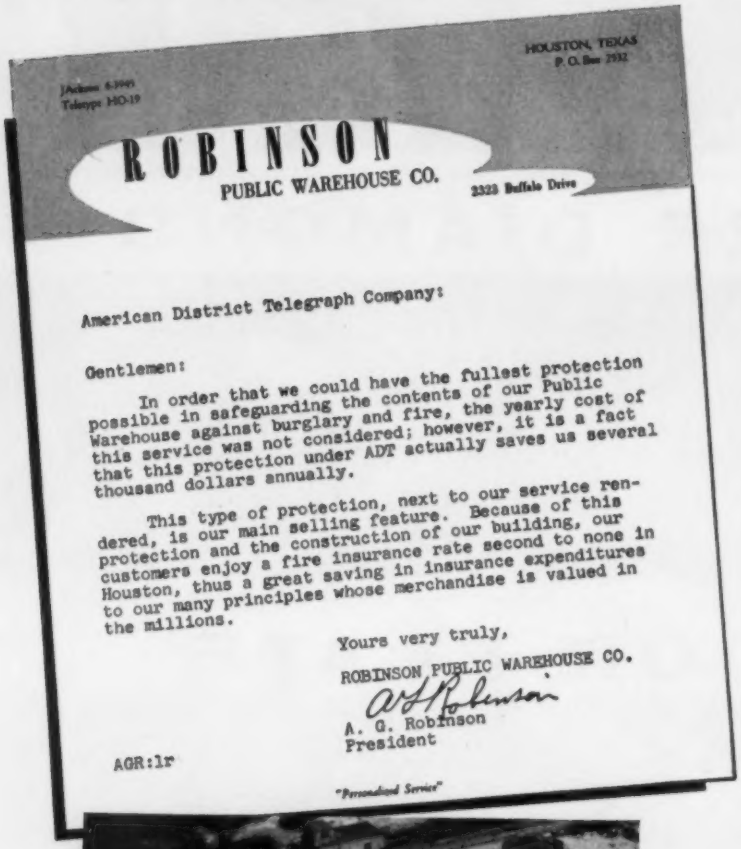
"Fullest Protection Possible... Saves Us Several Thousand Dollars Annually"



HOUSTON, TEXAS
P. O. Box 2932

ROBINSON
PUBLIC WAREHOUSE CO.
2323 Buffalo Drive

American District Telegraph Company:

Gentlemen:

In order that we could have the fullest protection possible in safeguarding the contents of our Public Warehouse against burglary and fire, the yearly cost of this service was not considered; however, it is a fact that this protection under ADT actually saves us several thousand dollars annually.

This type of protection, next to our service rendered, is our main selling feature. Because of this protection and the construction of our building, our customers enjoy a fire insurance rate second to none in Houston, thus a great saving in insurance expenditures to our many principles whose merchandise is valued in the millions.

Yours very truly,

ROBINSON PUBLIC WAREHOUSE CO.

A. G. Robinson
President

AGR:lr

"Personalized Service"

We couldn't have written a better headline for our own advertisement than this excerpt from Mr. Robinson's letter. Indeed, Mr. Robinson not only speaks for himself and ADT—he expresses the conclusions of thousands of ADT subscribers from coast-to-coast who have also discovered that *the best security is the most economical!*

AMERICAN DISTRICT TELEGRAPH COMPANY
Executive Office: 155 Sixth Avenue, New York 13, N. Y.
A NATIONWIDE ORGANIZATION

ADT

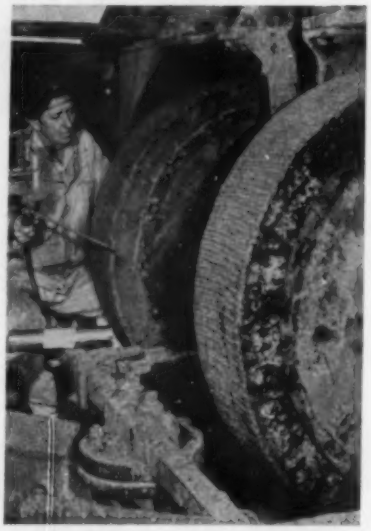
Circle 532 on postcard, page 33

PLANT ENGINEERS' DIGEST

(Digest begins on page 42)

cement. When this layer was dry it was topped with a 3-in. mixture of concrete. The insulation blocks support this load. *From a release of Keasbey and Mattison Co., Ambler, Pennsylvania.*

Twice the Wear at Half the Price



Muller tires when protected with an overlay of Colmonoy No. 2 lasted twice as long as unprotected tires. Hard-surfacing ¼-in. electrode, in beads, was applied by arc welding around the periphery of wheel at Valley Brick & Supply, Van Nuys, Calif. Rebuilding costs are 50 per cent of a new wheel. (From a release of Wall Colmonoy Corp., Detroit, Mich.)

Phenolic Valves Resist Corrosion

ONE THOUSAND phenolic sampling valves, in a one-year test at a chemical filter press installation of Toms River Chemical Corp., Toms River, N. J., have demonstrated their resistance to corrosive acids and alkalies.

The valves, made by Continental Mfg. Co., Cincinnati, Ohio, were made of a special phenolic molding compound.

Forty valves were installed along the bottom of each of 25 presses which filter a variety of alkaline and acid solutions. With a constant flow through the valves, a sample can be drawn at any time by a one-quarter turn of any valve.

Temperatures throughout the

Easily-installed PPG Neoprene-coated Duct Liner now meets fire requirements, provides extra margin of safety on ductwork installations.

NOW—PPG Fiber Glass Duct Liner Carries the UL Label

PPG Neoprene-Coated Superfine Duct Liner Meets All Requirements of NBFU Bulletins No. 90-A and 90-B for Ducts

YOUR ASSURANCE OF SAFETY

PPG is proud to announce that its Neoprene-coated Superfine Fiber Glass Duct Liner has been thoroughly tested according to the condition determined by National Board of Fire Underwriters, and has met the Board's rigid safety requirements in compliance with Bulletins No. 90-A and 90-B for ducts. It now bears the label of the Underwriter's Laboratories, Inc.

For you, this means that PPG Neoprene-coated Fiber Glass Duct Liner meets fire requirements and provides that extra margin of safety on any ductwork installation.

PLUS ALL THOSE EXTRA PPG ADVANTAGES...

. . . such as lightweight, easy handling, easy cutting and piecing, low wastage, fast installation, fine acoustical qualities, good thermal barrier characteristics, low resistance to air flow, no air erosion; and lifetime service, because it won't rot or decay, is not affected by humidity or dryness.

Give PPG Fiber Glass Duct Liner a try. It offers you a combination of top-flight insulation and economy. For full information, call your nearest PPG Fiber Glass Sales Office, or write *Pittsburgh Plate Glass Company, Fiber Glass Division, One Gateway Center, Pittsburgh 22, Pennsylvania.*

Sales Offices: Atlanta, Attleboro, Buffalo, Charlotte, Chicago, Cincinnati, Cleveland, Dallas, Denver, Detroit, Fort Wayne, Houston, Kansas City, Louisville, Los Angeles, Milwaukee, Minneapolis, New Orleans, New York, Philadelphia, Pittsburgh, San Francisco, St. Louis and Washington.

FIBER PPG GLASS PITTSBURGH PLATE GLASS COMPANY

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"Call FOSTER for Rail"...Get Relayers PLUS

Installing or expanding in-plant trackage? Foster will deliver Quality Relaying Rail at lower cost . . . "plus" all necessary new track accessories, switch material—even the track tools to do the job. To help select the materials best suited to your job, call the Foster Track Specialist.

You will save on freight from Foster's nationwide warehouses, all of which stock all sections of relaying rail "plus" new rail for crane runways and specialized applications.

Another "plus": Foster's Track Inspection Kit, which illustrates all the elements needed for an efficient industrial siding. It's a real help for proper track maintenance.

Write **L. B. FOSTER CO.** for free Track Kit PE-8 Pittsburgh 30, New York 7, Chicago 4, Houston 2, Los Angeles 5, Atlanta 8, Cleveland 35.

Faster From Foster

Pipe • Rental Steel-Sheet Piling • Pipe Pile • Rail

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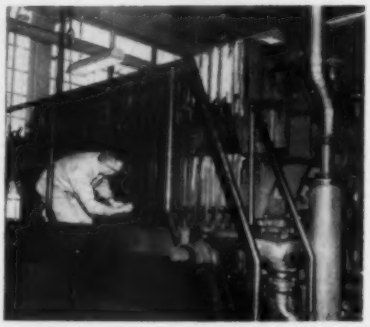
PLANT ENGINEERS' DIGEST

(Digest begins on page 42)



Heat- and chemical-resistant, valves need no maintenance, require one-quarter turn to obtain flow sample.

presses range from 32 F to 195 F, and pressures range from 0 to 25 lb. After a year of continuous contact with corrosive media, the phenolic sampling valves were reported to be trouble-free, with no maintenance required. *From a release of Hooker Chemical Corp., Niagara Falls, N. Y.*

Airless Blast Cleaning Cuts Costs

FOUR high-capacity abrasive propelling units were utilized by Western Bridge and Steel Fabricators Ltd., Vancouver, B. C., for mechanical descaling of structural steel.

This method of airless abrasive blast cleaning proved to be 50 per cent less expensive than former methods used and reduced long-term maintenance of bridges, other structures. It also provided a good bond for paint adhesion. *From a release of Wheelabrator Corp., Mishawaka, Ind.*

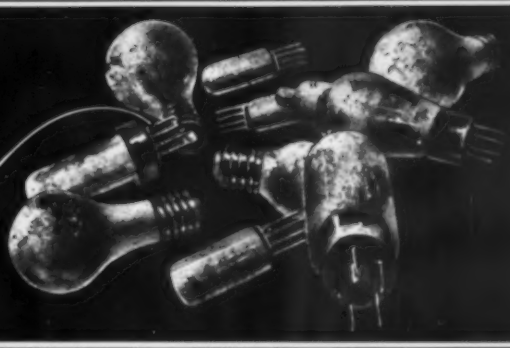
Structural steel is passed through airless abrasive blast cleaning unit.

REPAIR

Motor failed. Insulation damaged by overheating. Cause: Underwoltage

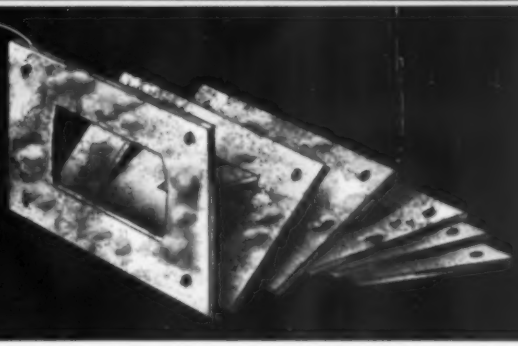
REPLACE

Electronic tubes and incandescent lamp bulbs burned out--Overwoltage



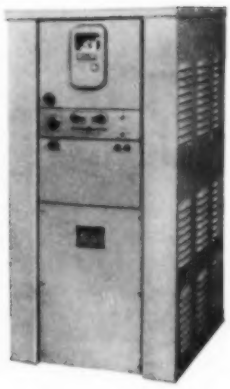
REJECT

Paint blistered and scorched in infrared drying oven as a result of Overwoltage



Victims of voltage vandalism

Increase production-line efficiency, product quality, and plant profits with General Electric Inductrol® voltage regulators



Repair! Replace! Reject! When voltage plays pranks, production-line efficiency suffers. Machines fail. Lighting efficiency drops. Computers give wrong answers. Motors overheat. Electronic tubes burn out.

These and other costly results of voltage vandalism can be avoided by the use of General Electric Inductrol voltage regulators. And only Inductrol regulators give you all these important advantages:

- Automatic ±1% control accuracy
- Stepless, drift-free control
- 100% overload capacity up to 1 hour
- 97 to over 99% efficiency
- Load, power-factor and frequency compensated
- No harmful waveform distortion
- Rugged, compact construction

Inductrol regulators are available in three basic types—automatic, motor-driven and hand-operated—and in a wide range of ratings. For full information, call your G-E Sales Engineer. Or write for Bulletin GEC-1450 to General Electric Co., Section 457-08, Schenectady 5, N. Y. *Voltage Regulator Products Section, Pittsfield, Mass.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

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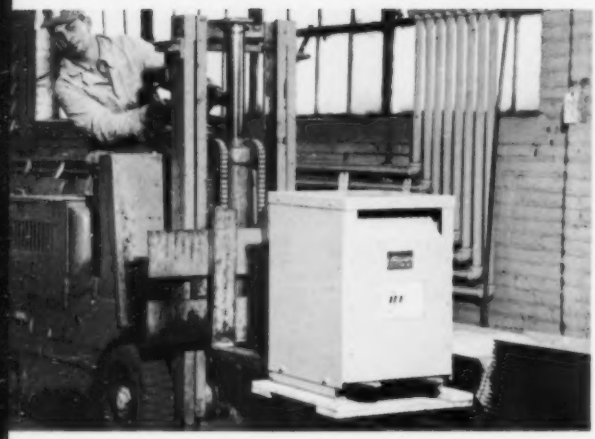
Circle 535 on postcard, page 33 →



Transformers are shipped on pallets which makes it easy for you to use a fork truck to position General Electric QHT dry-type transformers for mounting.

Keyhole slots hold QHT transformer in place. Built-in mounting provisions eliminate need for wall brackets.

Hook up this General Electric QHT transformer in only 18 minutes

You save time and money every time you install a General Electric QHT dry-type transformer.

First, QHT transformers are easy to handle. They offer savings up to 50 percent in weight and 67 percent in size compared with other dry-types. You can place QHT units near the load and save the cost of long, low-voltage feeders. They don't require vaults, barriers, or ventilating fans.

Entire front panel is removable to expose all terminal and tap connections. All connections are up front.

Second, you wire QHT transformers from the front. There's a complete wiring diagram on the nameplate. Dual-sized conduit knockouts are placed so that you can run cable straight into the connectors. And large, roomy terminal compartments, solderless connectors, and numbered terminals help you to complete wiring in 18 minutes.

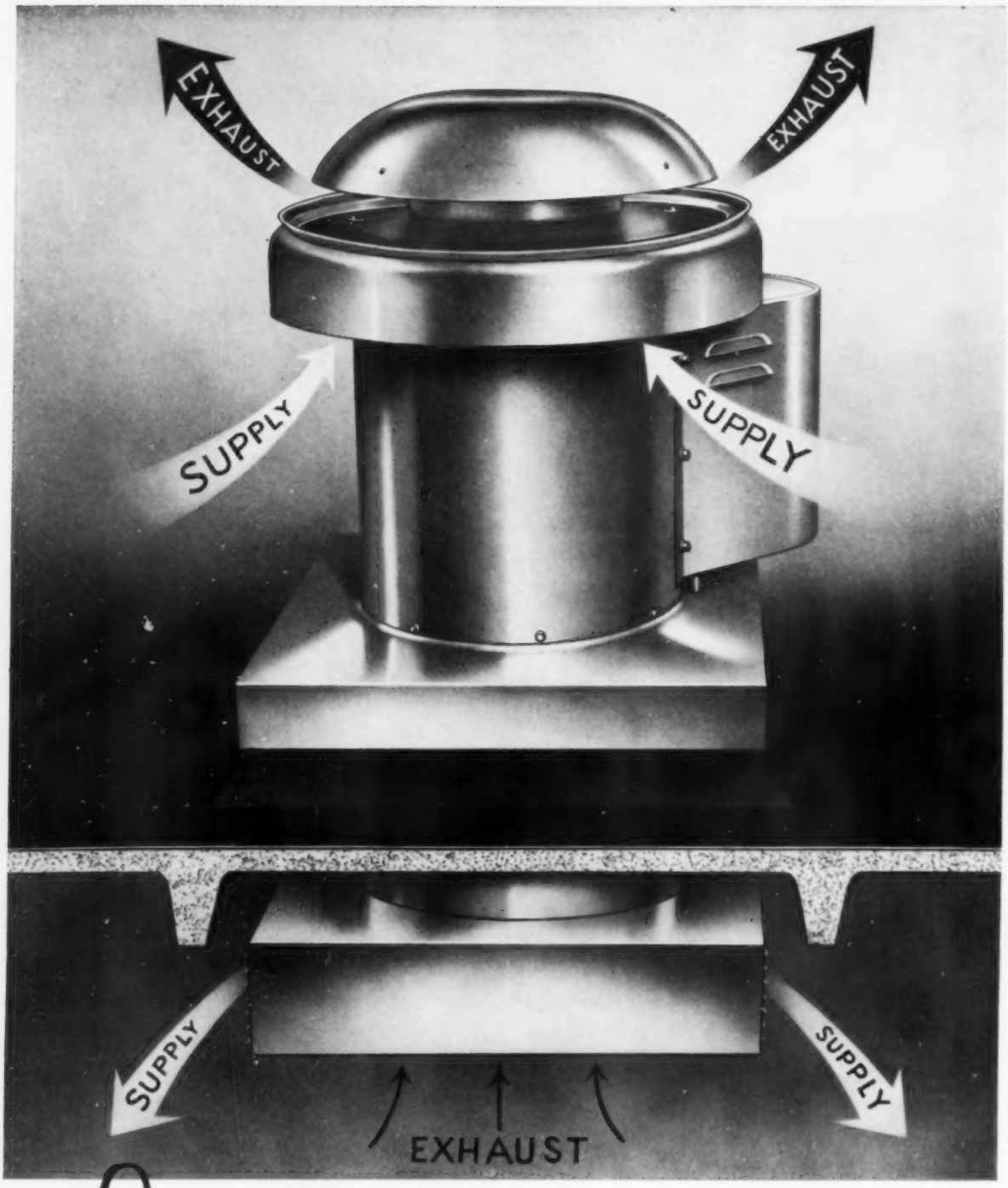
The new General Electric QHT dry-types are quiet—at least 15 decibels quieter than older designs, making them ideal for schools, hospitals, office buildings, and other places where noise could be a problem. All QHT units have sound ratings equal to or less than NEMA standards. On larger units, welded steel clamps minimize core vibration. The core assembly is mounted on built-in rubber pads to reduce noise transfer through conduits and mounting brackets.

You can get 24 hour delivery on most models from your nearby General Electric distributor. For more information, call him today or write to Section 411-17, General Electric Co., Schenectady 5, N. Y.

* Registered trademark of General Electric Co. for quiet, high-temperature dry-type transformers.

Progress Is Our Most Important Product

GENERAL ELECTRIC

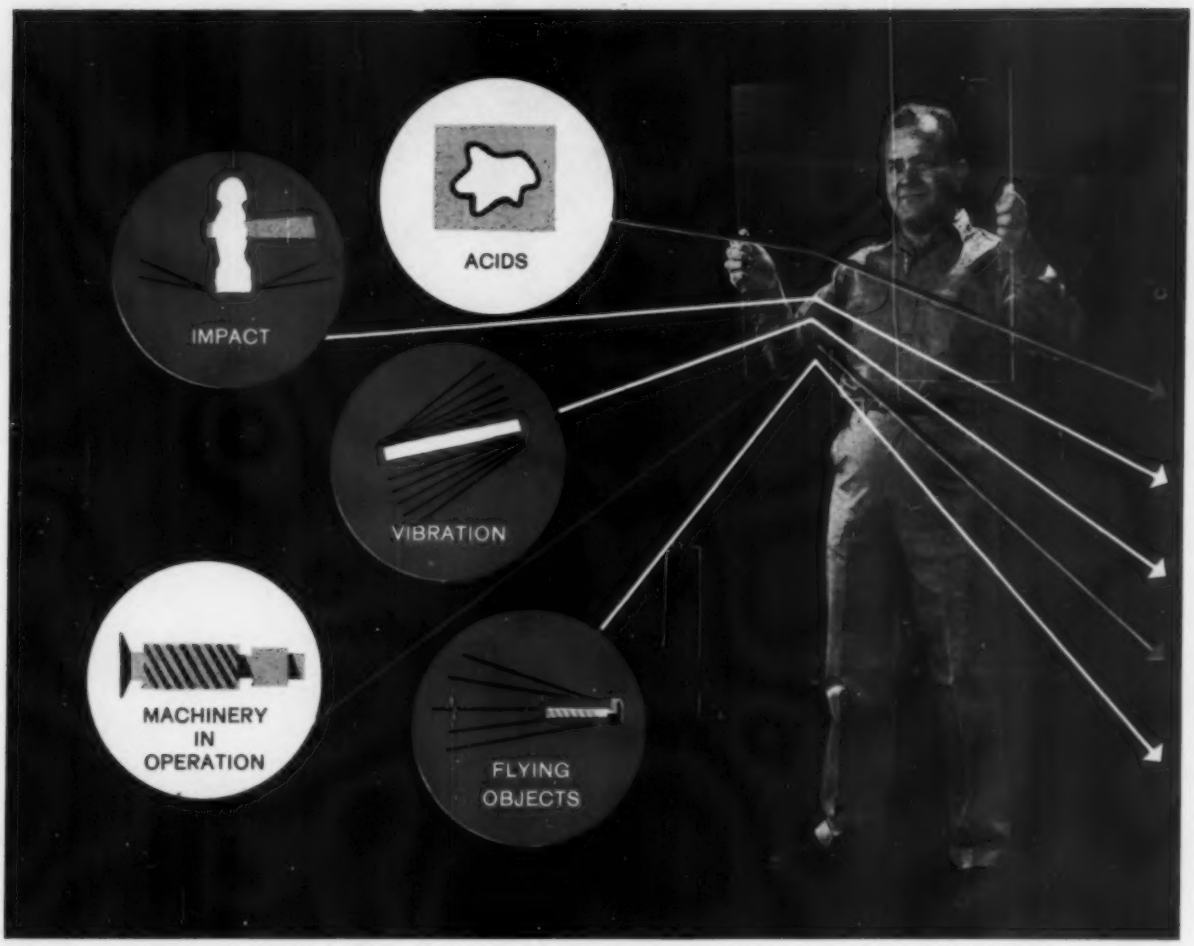


One impeller does it

You get both air supply and exhaust simultaneously with the new Clarage TWINALATOR*. Unique, superior dual function air handling for all types of buildings. Definite money-saving advantages: Requires only one opening, one motor, one drive, one starter. No make-up air unit necessary. Applications unlimited — well adapted to closed or semi-closed systems. Can be provided with heating coils and filters. Write today for Bulletin 552. CLARAGE FAN COMPANY, Kalamazoo, Michigan. Clarage sales engineering offices are located in all principal cities.

*Patented Trademark

Circle 536 on postcard, page 33



Plexiglas—between you and an accident

There's one good answer when you want to provide protection—*without loss of visibility*—from flying objects, moving machinery, splashing acids and other on-the-job hazards. Use PLEXIGLAS® acrylic plastic for safety guards, protective covers, inspection windows, shields, and window glazing.

PLEXIGLAS has crystal-clear transparency. It resists breakage, chipping and most chemicals. It can be formed easily and economically to almost any shape, and can be machined, drilled and cut like wood or soft metals.

Local Authorized PLEXIGLAS Distributors will be pleased to supply you with full information. Your Distributor is listed under PLEXIGLAS in the Plastics section of the telephone directory.

ROHM & HAAS
PHILADELPHIA 5, PA.

In Canada: *Rohm & Haas Company of Canada, Ltd., West Hill, Ontario*

CALL YOUR AUTHORIZED PLEXIGLAS DISTRIBUTOR

PROMPT DELIVERY • TECHNICAL ADVICE • FULL RANGE OF SIZES AND COLORS

Circle 537 on postcard, page 33

Realock Fence won't last as long as the Pyramids but...

... this sturdy chain link fence will give *your* property a lifetime of reliable protection. Made from top grade steel wire, Realock Fence is strong and durable, neat and trim looking. It's recommended where security of buildings, grounds and equipment is essential.

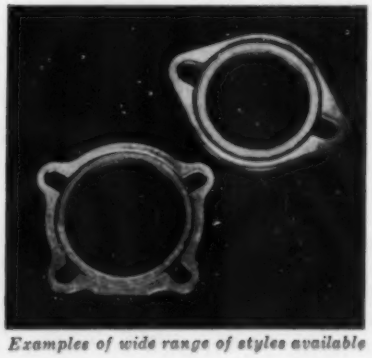
Realock Fence is completely galvanized to assure long-lasting resistance to corrosion, and is available in a variety of types. For a free estimate at no obligation, call the nearest CF&I office.

The Colorado Fuel and Iron Corporation
Denver • Oakland • New York
Sales Offices in All Key Cities

Circle 538 on postcard, page 33

"Spring Action" gives you a leakproof seal with J-M SPIROTALLIC® GASKETS

Johns-Manville makes a specialty of building a lively "spring action" into Spirotallic Gaskets. Because of their superior resiliency, Spirotallic Gaskets can compensate for varying stresses and temperature changes ... follow minor flange separation ... and absorb vibration. Even under these difficult circumstances, they keep a tight, durable seal.



Examples of wide range of styles available

This quick adaptability has given Spirotallic Gaskets a tremendous popularity in the field. Their springiness is due to the special methods and control J-M uses in their manufacture. Spring-like metal strips, formed into a special vee shape, are alternately spiral-wound with an asbestos filler. The filler does the sealing . . . and the vee shape provides the "spring."

Another reason for the widespread acceptance of Spirotallic Gaskets is the fact that when the gasket has been compressed the proper amount, it reaches optimum performance for the bolting. Many different metals and fillers can be used. Each metal is color-coded to aid maintenance personnel in quick identification of the type of metal used.

J-M produces a wide variety of sizes and shapes for standard flanges. And for special flanges, J-M will design and produce a gasket with the precise characteristics you require. For complete information, ask for J-M catalog PK-35A. Write to Johns-Manville, Box 14, New York 16, N. Y. In Canada: Port Credit, Ontario.

JOHNS-MANVILLE

Circle 539 on postcard, page 33

OPERATION AND PRODUCTION—pointers for the industrial plant engineer

Edited by Ken Lawson

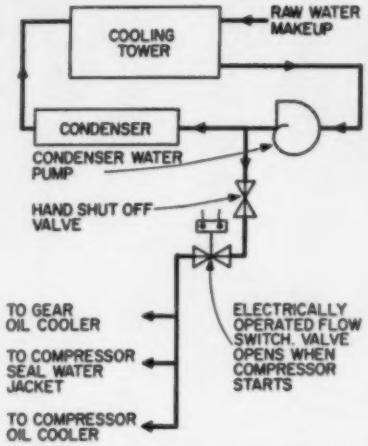
Reuse Your Waste Water

By C. W. Baldwin

WHENEVER I see good clean water going down the drain I wince. Those bubbles all have dollar signs on them.

In the usual centrifugal refrigeration installation, city water is piped to the gear oil cooler, compressor seal water jacket and the compressor oil cooler. Quantity of water used frequently averages about 2 gpm per hundred tons of refrigeration.

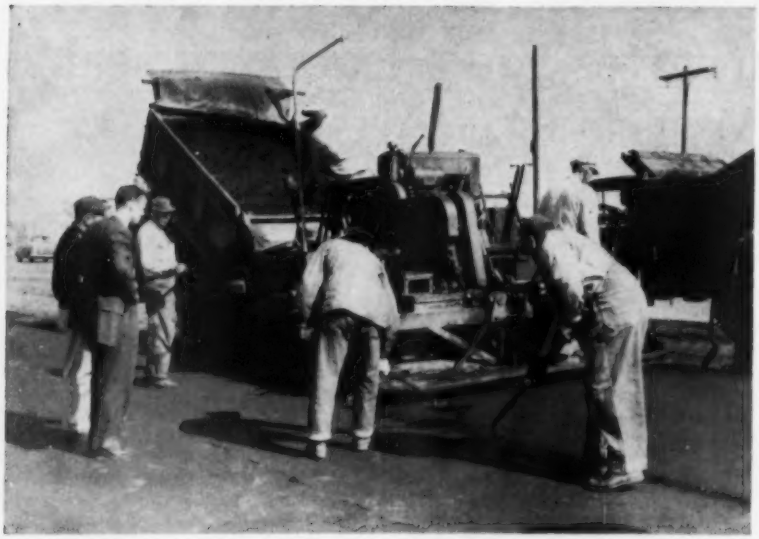
At the same time the water cooled condenser is usually piped to a cooling tower which requires about 3 gpm per hundred tons of refrigeration for makeup water to compensate for windage, evaporation loss, etc. It seems logical that the waste water from the jacketed cooling system in the compressor should be used to supplement makeup to the tower. I have used this method on previous jobs and it works very well, resulting in a water saving of about $56.00 per month based on a rate of 65 cents per 1000 gal.



Schematic drawing shows flow of cooling tower water to compressor water jackets then to drain—doubling as a bleed-off line for tower water.

On my last assignment in plant engineering at Melpar, Inc., Falls Church, Va., in order to prevent corrosion and scale in the water jackets due to passing of raw water through them, I piped treated cooling tower water through the compressor cooling systems to the drain. Treated water which formerly wasted to a drain as overflow bleed water from the cooling tower, now wastes through the cooling water jacket systems as illustrated.

Asphalt Paving Mix With Asbestos Fiber Improves Performance and Life



Plant parking lots and other areas usually paved with asphalt will benefit by tests being conducted in eight states. Present indications are that paving performance and life are considerably improved by the addition of two to three per cent short asbestos fiber to asphalt paving mixes. According to Johns-Manville researchers, these mixes give a tougher road surface with increased resistance to indentation, less brittleness and few surface cracks.

Ferrite Tool Lasts 12 Times Longer

IN TESTING a new tungsten tool and die steel at its Poughkeepsie, N.Y., plant, I.B.M. Corporation has achieved up to 12 times the service life formerly obtainable from punch holders used in compacting extremely abrasive powdered iron oxide.

The tools are subject to unusually difficult wear conditions in the manufacture of ferrite magnetic cores for the memory apparatus in electronic computers.

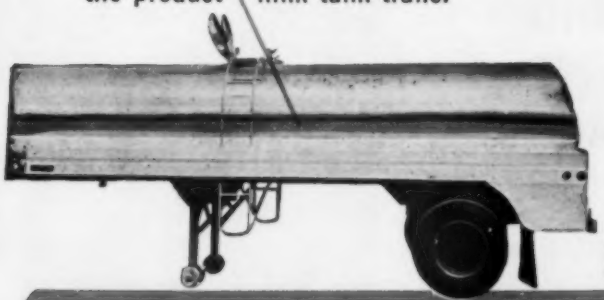
The magnetic cores have a hole diameter of 0.030 in., an OD of 0.050 in., and a thickness of 0.012 in. They weigh 1.3 milligrams, and are held within plus or minus 1/10 of a milligram to that weight. After pressing, they are sintered to withstand final usage.

When made from conventional tool steels, the punch holders would last from four to six weeks. They then had to be replaced because of abrasive wear on the head and side of the shaft. Galling and seizing would occur, and, in some instances, the tools would break.

They then tried Hi Wear 64, a wear-resistant steel developed by The Carpenter Steel Company, because of its ease of handling and dimensional stability in heat treat. Some holders, made from this material for cold work applications, have been tested for as long as a year with virtually no trace of wear.

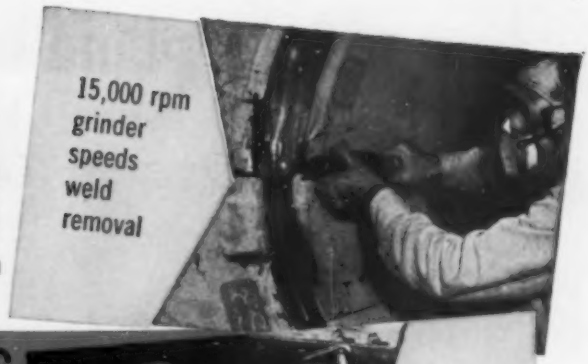
This is a deep hardening steel which combines the simplicity of a low hardening temperature with excellent wear resistance and good dimensional stability. Because of its low hardening temperature and deep hardenability, it is essentially a non-deforming tool and die steel. The low hardening temperature also means that the steel has little tendency to decarburize. Ability of the tool to work with little or no lubrication is important because the powder used in forming

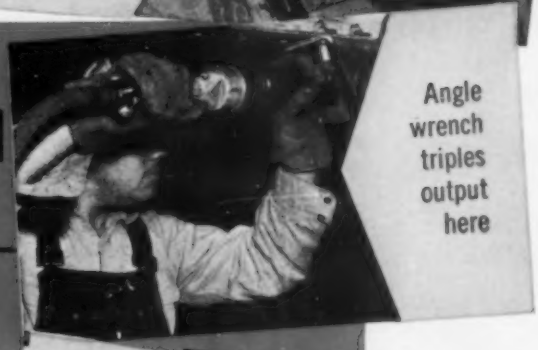
the product milk tank trailer

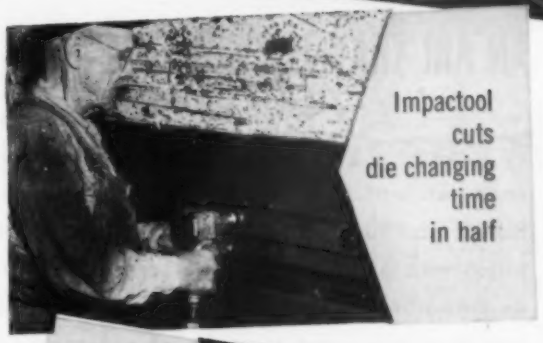


INCREASED OUTPUT PAYS FOR RETOOLING PROGRAM IN 58 DAYS...

NETS $58,000 DIVIDEND/YEAR!







Inefficient and outdated power tools were costing this plant money. A power tool study revealed that in the assembly of tank trucks alone, 29 out of 66 tools were operating at only 40 to 50% efficiency.

New, more efficient Ingersoll-Rand Air Tools with full power and speed replaced the old tools. Fifteen additional I-R tools were installed to cut fabrication time on other operations. Leaks, faulty oilers and air filters were corrected. The net result: increased production that amounted to a $58,000 Dividend on Payroll Dollars the first year.*

With production increases making up the full cost of the tool replacement program in just 58.6 working days, an immediate Planned Annual Retooling program was started to maintain peak tool efficiency and maximum output.

A power tool study in your plant can more than likely show how you can reduce your costs through increased output per man with more efficient tools.

*For details, call your I-R AIRengineer or write Ingersoll-Rand, 11 Broadway, New York 4, N.Y.

216A-8

Ingersoll-Rand

Planned Annual Retooling increases output per man

Circle 540 on postcard, page 33

Just off the plane and HERE COMES YOUR LUGGAGE

Turntables in incoming domestic flight area at Montreal International Air Terminal. The 80-foot perimeter of each slowly rotating luggage dispenser provides adequate space for passengers to identify and claim their luggage.

AN AIR TRAVELER'S DREAM COME TRUE!

You have just stepped off a plane with other jet-age travelers, and already an intricate system of belt conveyers, vertical hoists and turntables has been set in motion. The object—to get your luggage to you as quickly and as smoothly as possible—without confusion or delay. This is a good example of outstanding performance—the extra you get in Mathews Conveyers.

Write today for Bulletins U.A.L. 61—M.I.A. 561.

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MATHEWS

Over Fifty Years of Leadership in Mechanized Handling

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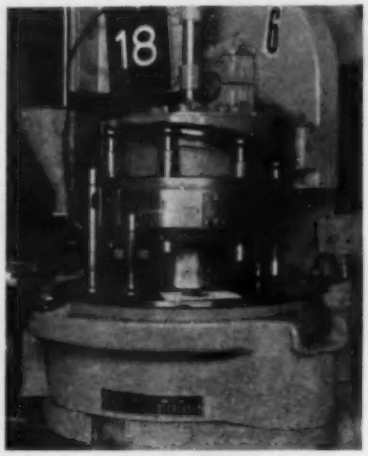
OPERATION—PRODUCTION

(O and P begins on page 58)



Closeup shows cam surface and top and bottom tungsten steel punches.

the cores must remain perfectly dry.

With the wear problem reduced, I.B.M. now operates eight punches simultaneously on one machine. Production capacity has thus been increased 800 per cent per machine.

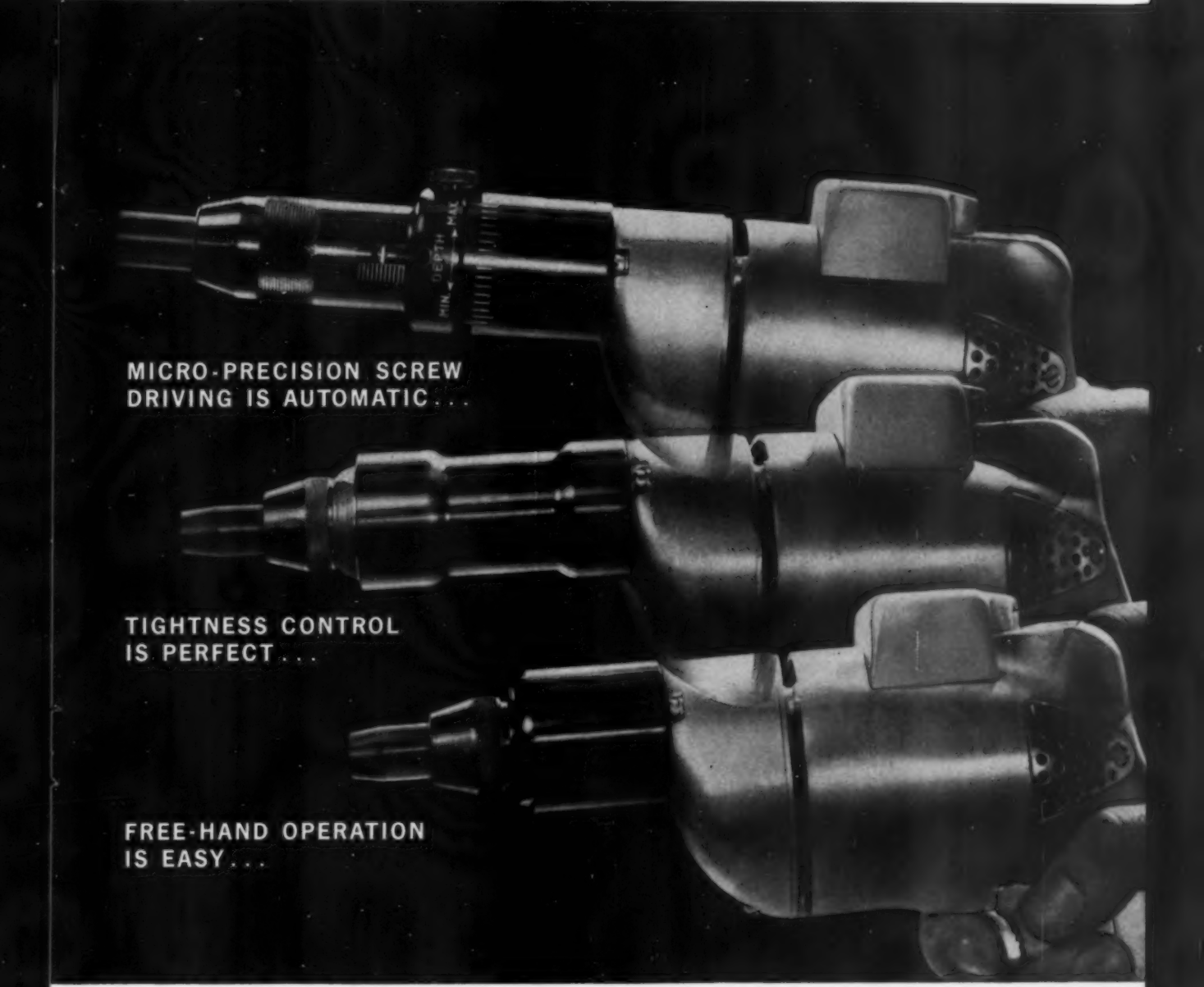
Circuit Monitor Spots Trouble

MEMORY-type fault detection offers greater reliability and speeds troubleshooting procedures on complicated steel mill control systems. Recently developed by Allis-Chalmers Manufacturing Company, Milwaukee, a device of this type indicates any malfunctioning of control circuits.

A typical faultfinder consists of a transistor, silicon controlled rectifier, capacitor and neon indicating light. Time delay characteristics are readily altered to prevent false indications in case of contact bounce in the circuit being monitored. The circuit is arranged so that any change in state beyond the time delay interval in the monitored circuit will trigger the controlled rectifier and turn on the indicating light.

Later changes in the monitored circuit will not affect the indicating light until it has been manually reset. The input impedance of the fault detector circuit is extremely high so that it can be connected directly into the circuit. Although the indicating light circuit is designed for long lamp lift, a test switch has been included to assure that it is operative.

Produced in modules of eight cir-



Cut man-hours to minutes... with Black & Decker's Screw Driver Line

If you want to drive screws to a depth set with thousandths-of-an-inch accuracy . . . do it automatically with the B&D Micro-Clutch Scrugun Screw Driver. If you want to drive screws to the right degree of tightness . . . do it perfectly with the B&D Adjustable-Clutch Scrugun® If you want to drive screws free-hand with your personal touch . . . do it easily with the B&D Positive-Clutch Scrugun.

Famous Black & Decker power makes any job with every Scrugun easier yet. Scruguns are reversible, too. Check out the complete B&D line of 17 different screw drivers. NOW . . . see how they are made to stay on the job longer, designed to take pride in your work, always. Buy them at leading distributors everywhere. *For sales or service, look in the Yellow Pages of the telephone book under . . .* TOOLS ELECTRIC

Black & Decker®
WORLD'S LARGEST MAKER OF POWER TOOLS

Circle 542 on postcard, page 33

THE BLACK & DECKER MFG. CO., Dept. 0808
Towson 4, Maryland (In Canada: Brockville, Ont.)

☐ Please arrange a demonstration of_____
☐ Please send information on_____

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

☐ Saws ☐ Impact Wrenches ☐ Belt Sanders ☐ Drills

Dimensioned to your requirements, this new C. H. Wheeler development is the most modern pump available for the chemical, process, heating, ventilating and air-conditioning industries.

BHO End Suction Centrifugal Pumps are offered in 350 Series (stainless steel and corrosion resistant materials) for chemical and 300 Series (cast iron alloys and bronzes) for general process services.

A complete range of 14 pump sizes from 1″ to 5″ in both series. The size and type you need to do your job. Available for immediate shipment.

Call your C. H. Wheeler representative for full details or write for 12-page catalog and pump design manual.

WGR

C. H. WHEELER / GRISCOM-RUSSELL

Philadelphia 32, Pa. Massillon, Ohio

Affiliated sources for heat exchangers,
steam condensers, pumps, marine auxiliary equipment,
sea water distillation plants,
nuclear steam generators and related components.

Circle 543 on postcard, page 33

OPERATION—PRODUCTION

(O and P begins on page 58)

cuits, the fault detector is arranged for easy mounting on mill control boards. Circuit construction is simple so that maintenance needs can be easily met. It can monitor practically any circuit or device with complete isolation.

Built-in Flux Speeds Arc Welding

Electric arc welding of this 12-in. domestic water line at Carling Brewing Company plant, Baltimore, Md., is speeded by fluxing action of iron silicate fibers in A. M. Byers 4-D wrought iron pipe. The iron silicate melts at a lower temperature than the base metal. This aids in making a stronger weld.

Automated Waste Disposal

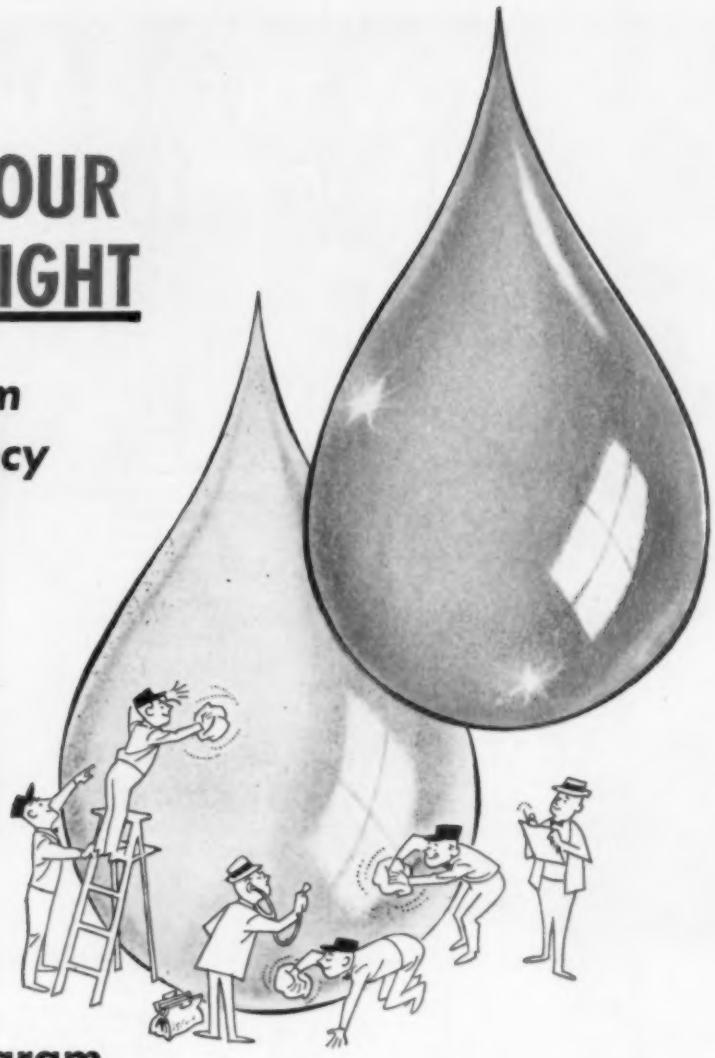
GETTING RID OF REFUSE can be a costly, critical, time-consuming chore. This problem faced General Electric Company's Missile and Space Vehicle Department in Philadelphia. Each day a 7½-ton mountain of paper is hauled to the company's incinerator. And each day, as much as a ton of highly confidential classified material had to be stored in sealed trucks, closely watched, and hauled, under armed guard, to the City of Philadelphia's combustion chamber.

Automation of waste disposal ended the risk, inconvenience, and needless labor and expense of this refuse-handling operation. A Somat automatic waste disposal system was installed at track level, with access to street, to disintegrate this waste and automatically eject finely compacted pulp into a truck outside the building.

As a result of this automation,

TREAT YOUR WATER RIGHT

For Maximum Plant Efficiency



nalco® offers A complete program for lasting results in:

Clarification . . . dependable flocculation and settling with coagulants and coagulant aids.

Boiler water conditioning . . . positive control of corrosion and deposits, steam purity, and condensate system corrosion.

Cooling water treatment . . . prevention of deposits, corrosion and microbiological fouling.

Process water preparation . . . to meet specific requirements.

Good water for your uses is like a good man on the payroll: always delivering the most value for dollars spent. And, like a good man, your water performs best when treated right. Here's where Nalco enters the picture with specialized skills, experience, and chemicals to help you treat your water right. Nalco services include consultation . . . assistance in selecting equipment and treatment programs to provide maximum benefits from all water treatment systems.

Call your Nalco Representative for prompt help in getting lasting results from your water treatment programs. Ask him, too, for Nalco Reprint 79: "Water: A Unique Engineering Material," or write direct for your free copy.

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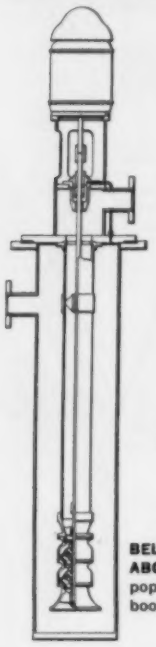
...Serving Industry through Practical Applied Science

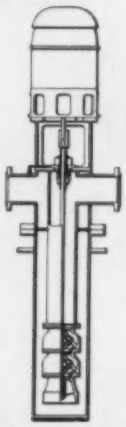
Nalco CHEMICALS
Nalco SERVICES

Circle 544 on postcard, page 33

Examples of Johnston Versatility:

STANDARD UNIT— Designed to pump from underground storage tanks.





SUCTION AND DISCHARGE ABOVE GRADE— perfect process or in-line pump.

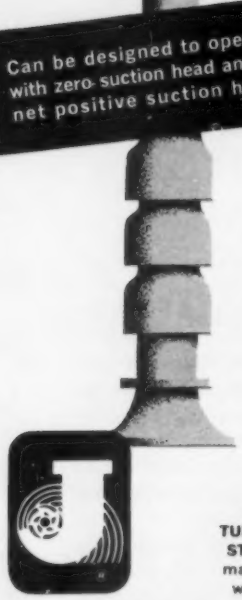
BELOW-GRADE SUCTION— ABOVE-GRADE DISCHARGE— popular for line booster service.

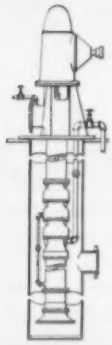
VERSATILE VERTICALS BY JOHNSTON

FOR VOLATILE FLUIDS

GASOLINE - CRUDE OIL - AMMONIA - L-P GASES
PIPE LINES - REFINERIES - AIRPORTS

Can be designed to operate with zero suction head and/or net positive suction head.





COMBINATION TURBINE-PROPELLER STRIPPING PUMP— maximum suction lift without vapor lock.

WET PIT BOOSTER, TRANSFER OR CIRCULATING PUMP— no expensive priming device necessary.

DIRECT DISPENSING— For transfer of volatile liquids and chemicals.

UNLIMITED FLEXIBILITY—Johnstons fit **any** piping layout—satisfy virtually all pumping requirements.

CHECK THESE OTHER FEATURES: Economy of higher speeds; Non-overloading power characteristics; Steep head-capacity stability.

For complete details and typical applications, write for colorful bulletin.

Versatile Verticals by

JOHNSTON PUMP COMPANY
3272 E. Foothill Blvd., Pasadena, California

Circle 545 on postcard, page 33

OPERATION—PRODUCTION

(O and P begins on page 58)

there is no danger of classified material falling into the wrong hands; pulp from this unit is completely unreadable. Sealed trucks, and armed guards to watch them, are unnecessary. Objectionable incineration has been eliminated, along with one-day storage of flammable material. Waste

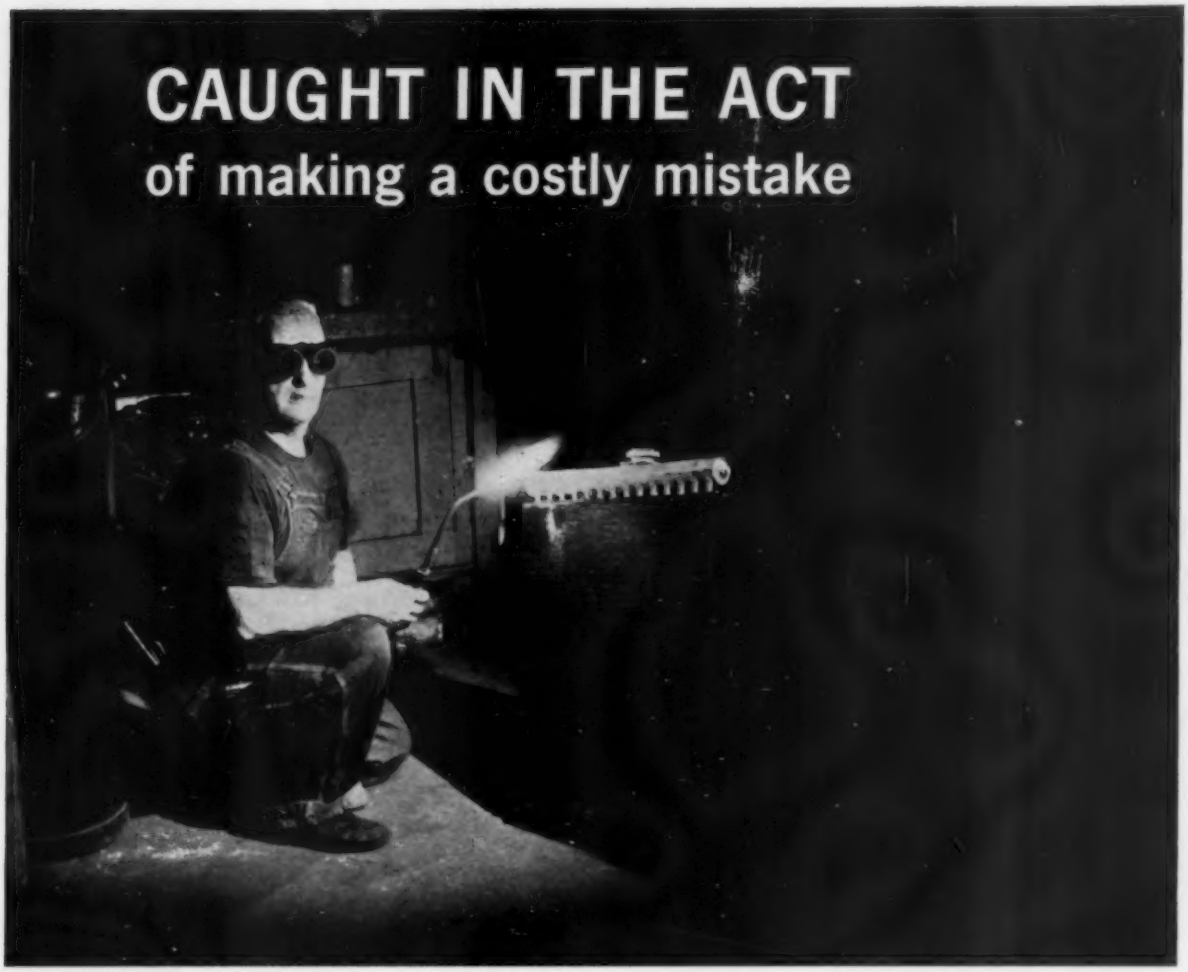
Waste moves by conveyor to a grinding tank partially filled with water.

After removal of the excess moisture, the unit discharges the semi-dry pulp.

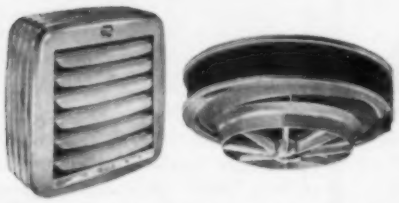
handling requires far less manpower. In addition, the grinding of waste results in a 75 per cent slash in trucking expenses. Concentrated pulp can be hauled in fewer trucks than were needed for hauling loose and voluminous waste.

A grinding tank and a "de-watering unit" comprise the "heart" of the

CAUGHT IN THE ACT
of making a costly mistake



don't waste money repairing old unit heaters
replace with new Modines!



MODINE STEAM AND HOT WATER UNIT HEATERS — Horizontal, vertical and Power-Throw® types . . . in a wide range of sizes.

MODINE GAS-FIRED UNIT HEATERS — Propeller units (shown) are attractive, lightweight. Eight sizes—25,000 to 310,000 Btu. Gas-fired blower units are available in seven models from 50,000 to 310,000 Btu.

We caught this man with his heater down! He should have taken this tip from Modine: when a 10- to 15-year old unit heater starts to leak, it's almost a sure sign useful life is over. One leak usually leads to another, making repairs a gamble.

Don't throw good money after bad. Instead, replace your old units with new Modines. On the Modine-Plan for replacement, you eliminate the danger of production interruptions due to unexpected heating failures. You avoid the expense of frequent, ineffective repairs. And you get the *finest;* new Modines heat better, use less fuel, run quieter, require only routine maintenance.

For full details on the Modine-Plan for replacement, contact your qualified heating contractor or your nearest Modine representative. Or write Modine Manufacturing Co., 1563 DeKoven Ave., Racine, Wis. SU-1444

Modine®
MANUFACTURING COMPANY

In Canada: Sarco Canada, Ltd., Toronto, Ont.

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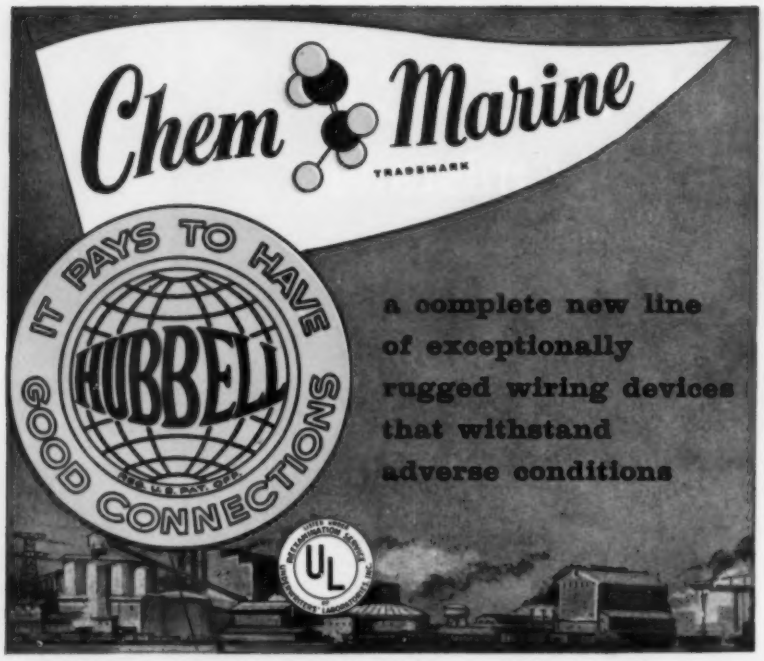


RESISTS CORROSION

This new super line of "Chem Marine" devices are engineered from corrosion resistant materials capable of withstanding the harmful effects of moisture, brine, grease, oils and many acids. They are designed for industrial applications such as plating rooms, shipping platforms, yards, shops, warehouses, or wherever corrosion or chemical action is a problem.

Special Materials:

"INSULPRENE"—a Du Pont neoprene compound.

"MONEL® METAL"—Reg. Trademark of INCO.

"MELAMINE"
"CYMEL®"—Reg. Trademark of Am. Cyanamid

HEAVY NICKEL-PLATED CURRENT CARRYING PARTS.

"Chem Marine" devices are identified by their bright yellow color and a few representative items are illustrated above. For complete information contact the "Chem Marine" Department,—

HARVEY HUBBELL, INCORPORATED
BRIDGEPORT 2, CONNECTICUT, In Canada: Scarborough, Ontario
Circle 547 on postcard, page 33

OPERATION—PRODUCTION

(O and P begins on page 58)

system. In the tank, a rotating grinding plate chews this waste into fine pulp. The slurry of pulp and water is pumped to an extractor which discharges semi-dry pulp into a waiting truck.

This equipment can also be used to convert worn-out fiber cases to salable pulp, to destroy food and paper waste simultaneously, and to destroy overage merchandise, packaging materials and glass bottles.

Bus Duct Reduces Voltage Drop

SPECIALLY designed for high frequency operation, a power distribution system has been installed in

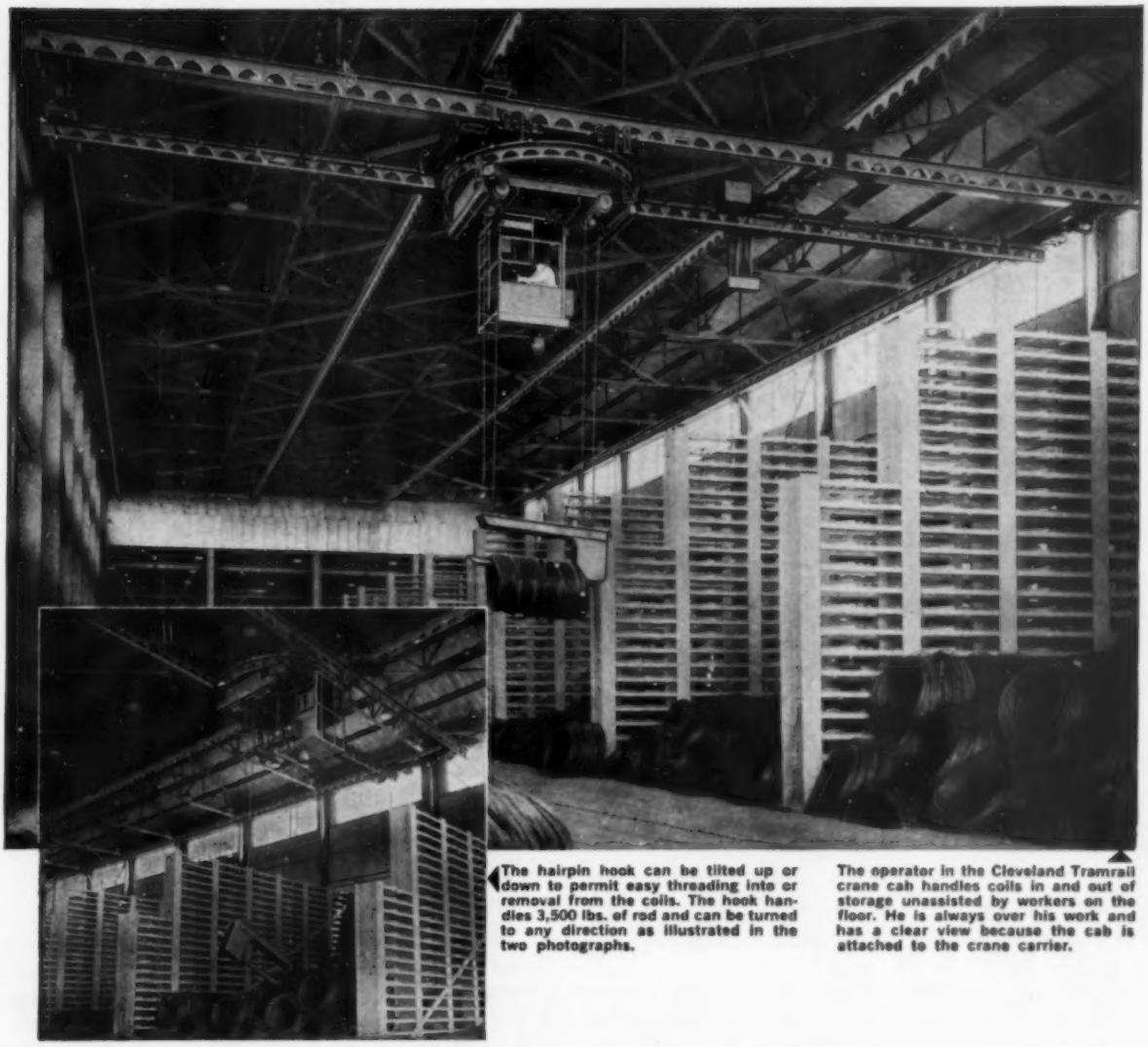
Conductors in 400 cycle bus duct are transposed to keep voltage drop low.

Grumman Aircraft Engineering Corporation's New Avionics Laboratory in Bethpage, Long Island, N. Y. Developed by Westinghouse in cooperation with Grumman engineers, the 400-cycle system uses bus duct with special features to provide closely regulated voltages for experimental work throughout the laboratory.

Conductors in the bus duct are periodically transposed and rotated to provide nearly perfect phase relationship everywhere in the system. Voltage drop at 400 cycles is less than one volt per 100 ft with the duct fully loaded. Four insulated openings are provided in each 10-ft section of duct to take off power through standard circuit breaker bus plugs.

Crane with ROTATING CARRIER

Provides Ultimate In Wire and Rod Handling Efficiency



The hairpin hook can be tilted up or down to permit easy threading into or removal from the coils. The hook handles 3,500 lbs. of rod and can be turned to any direction as illustrated in the two photographs.

The operator in the Cleveland Tramrail crane cab handles coils in and out of storage unassisted by workers on the floor. He is always over his work and has a clear view because the cab is attached to the crane carrier.

Five motions: hoisting, tilting, trolley travel, bridge travel and rotation are provided in a Cleveland Tramrail crane for handling coiled rod. The trolley travels on a 76-foot double-girder crane bridge from side to side of a building. A rotating carrier operates on a circular track built into the trolley. It turns unlimitedly in either direction. The crane travels on four runway tracks and is controlled from a cab which is attached to the carrier.

Coiled rod is picked up from incoming railroad cars by a hairpin-type hook and turned 90 degrees for placement into large bins along one side of the storage building. The hook can be tilted either up or down for threading into or drawing away from the coils.

The unit handles 3,500 lbs. of rod in addition to the weight of the hairpin hook. Bridge and trolley control are variable five-speed magnetic with dynamic braking. Hoist control is variable-speed drum type with dynamic lowering. Rotating control is automatic accelerating.

With a wealth of experience to draw on, Cleveland Tramrail engineers are in position to help you with a wide range of materials handling problems. We welcome an opportunity to work with you.

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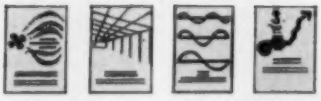
Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 7530 E. 288 ST. • WICKLIFFE, OHIO

Circle 548 on postcard, page 33

how to overcome basic heating problems



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REZNOR HEATERS

K-1385

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TEST MACHINE at a metal fabrication plant gets air from the Le Roi 100S2 shown below. Unit also supplies air for presses, automatic and manual welders, painting machines, and automatic assembly machines.

puts your plant air supply right where you need it!

LE ROI 100-HP STATIONARY COMPRESSOR

Trouble-free air-cooled LeRoi 100S2 delivers 450 cfm of air at 125 psi — yet takes up only 20 sq. ft. of floor space.

Any way you look at it, the Le Roi 100S2 two-stage stationary compressor is your best bet to lower your cost of compressed air.

It provides cool, clean airpower. And its compactness permits installation *near the point of use,* thus eliminating excess piping and costly waste of air. If you need more air, you just install more Le Roi S2 compressors — and you can still beat the cost of centralized air systems.

The electric-motor-driven 100S2 is easy to operate and maintain. Its Dual-Control permits either constant-speed or automatic start-and-stop operation. Air cooling eliminates plumbing and water line freeze-ups . . . permits indoor or outdoor installation. Balanced design reduces vibration and noise . . . extends compressor and motor life.

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LE ROI STATIONARY COMPRESSORS

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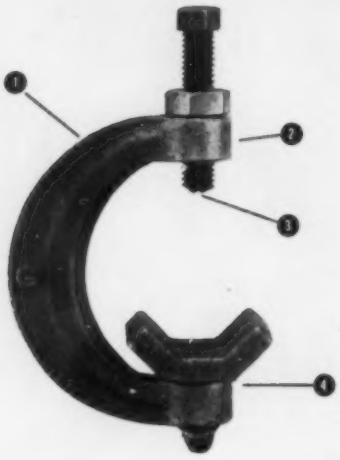
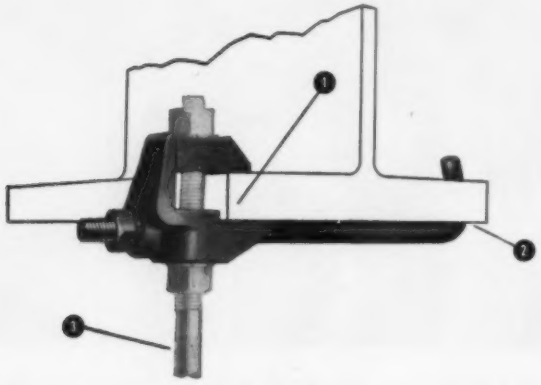
Circle 550 on postcard, page 33

You get extra features...at no extra cost ...when you specify Grinnell Beam Clamps!

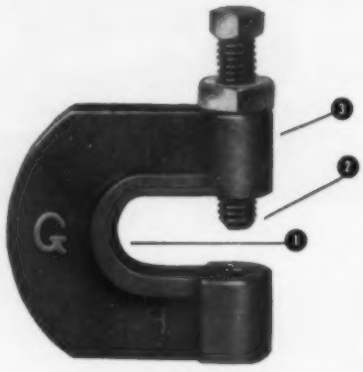


GRINNELL G-CLAMP HANGER, FIG. 92 — 1. Ribbed, malleable iron casting for greater strength, impact resistance. 2. Full thread engagement. 3. Hardened steel cup-point set screw for good "grip" on beam. 4. Saddle swivels 360°.

GRINNELL MALLEABLE BEAM CLAMP WITH EXTENSION PIECE, FIG. 229 — 1. Tie rod locks clamp in place when nuts are tightened. 2. One jaw size fits all beam flanges up to 7". 3. Malleable iron extension piece.



GRINNELL SIMPLEX SIDE I-BEAM CLAMP, FIG. 265 —1. 1¾" maximum jaw opening will take large beam flange thickness. 2. May be attached to beam of any flange width by merely ordering hook rod of suitable length. 3. Load ratings of 1,740 lbs.



GRINNELL G-CLAMP HANGER, FIG. 86 — 1. Ribbed, malleable iron casting for extra strength. 2. Hardened steel cup-point set screw for good "grip" on beam. 3. Full thread engagement — casting drilled and tapped for rod, set screw.

You get *more* Clamp for your money from Grinnell! Reason: Grinnell's huge volume reduces production costs . . . lowers prices right into line with competitive hangers that offer you much less.

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What's more, you always get dependable field service by trained Grinnell personnel . . . no matter how far from the job site the sale was made! Grinnell Company, Providence 1, Rhode Island.

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Call your local Grinnell Distributor for pipe hangers, cast and malleable iron fittings, steel nipples, welding fittings, Grinnell-Saunders Valves, unit heaters — all made by

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"Automation has raised our productivity to new high levels,"

reports a paper maker

Paper stock is automatically moved from this operation to the next by Jeffrey spiral conveyors.

JEFFREY
Spiral Conveyors

are a part of their automatically-controlled materials handling

• The high degree of automation recently introduced here has raised productivity per man to new high levels. Transfer of materials in process is largely under automatic control, for example, as evidenced by these Jeffrey spiral conveyor systems.

Jeffrey spiral conveyors offer an economical means of handling dry, loose bulk materials. Compact, they occupy a minimum of space. Convenient, they can be fed or discharged at any point along their length. Jeffrey makes them in open and dust-tight styles, of metals to suit particular requirements.

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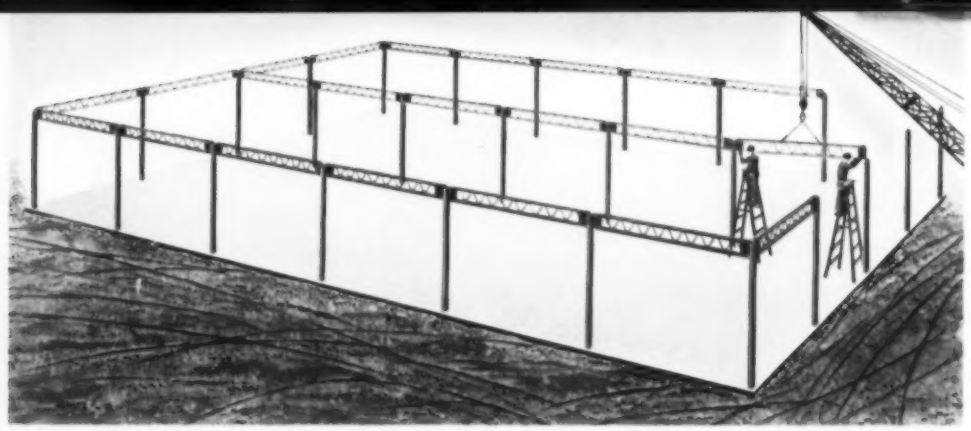
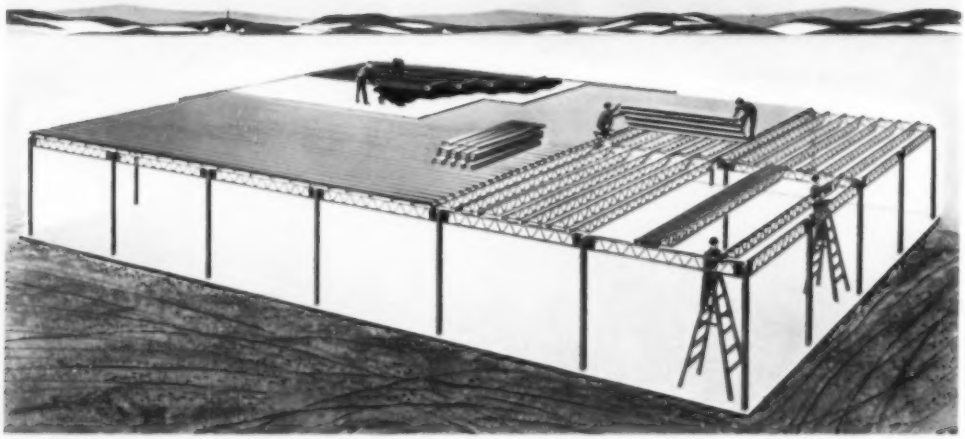
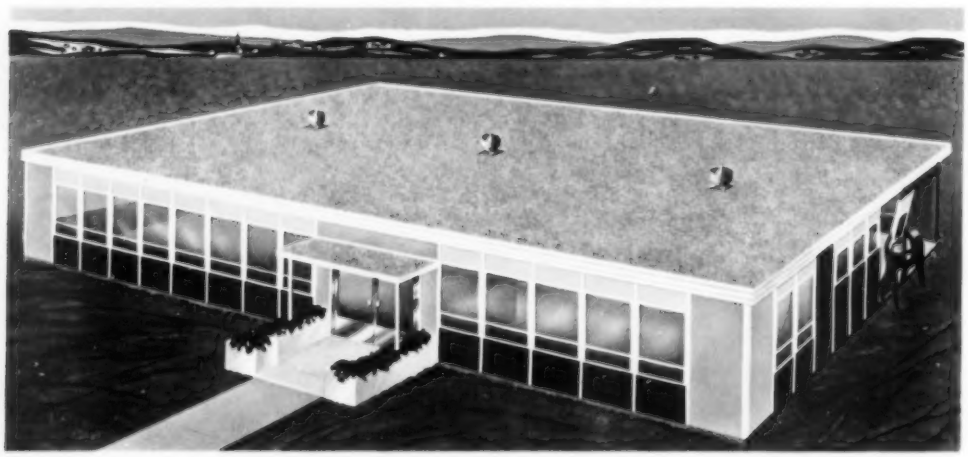


A sturdy frame . . .



A simple roof . . .



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This mark tells you a product is made of modern, dependable Steel.

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Today's steel is more strength than your dollar can buy in any other material. It is many extra feet of floor space because steel walls don't have to be thick to be strong. It is days saved in construction time and it's weather-proof—can be handled in any season, anywhere. It is colorful panels and gleaming mullions that help clean themselves. It is skyscrapers and schools, churches and commercial buildings because it is the architect's most versatile material for design.

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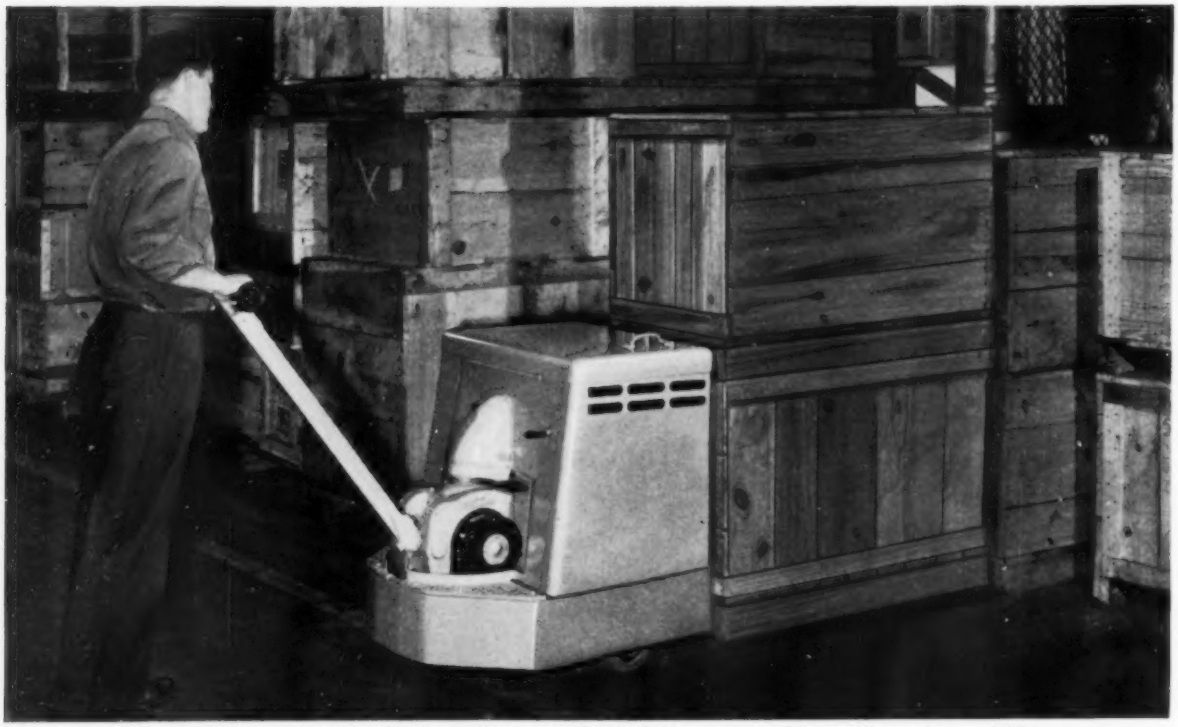
American Bridge Division of United States Steel

EXIDE POWER PACKAGE

Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.



Extra economy assurance for your new walkie-type truck—the Exide guarantee of battery life equal to truck life.

BATTERY GUARANTEED FOR LIFE OF TRUCK

Let's say you're about to buy a new walkie-type electric industrial truck. You want long battery life for maximum economy, and you don't want the nuisance of ever replacing the battery, if you can avoid it. Well, this is the Exide offer:

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The Exide Power Package. Recommended battery and charger from the world's broadest lines—plus factory-quality service to cover both.

This is not a reckless offer. Exide knows from countless actual performance records that these batteries readily give this kind of life. Many Exide nickel-iron-alkaline batteries have been used in walkie-truck service for upwards of 20 years and are still going strong. So the plain fact is that we are simply giving you positive assurance of battery value that is already there anyway.

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Of course, for any type electric industrial truck—walkie, rider, or narrow-aisle—the maximum power economy depends on three factors: the right battery for the job, a charger to match, and needed service. This combination is the Exide Power Package.

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The Exide Power Package is your easiest way to get not only maximum battery life in your applications, but maximum battery economy year after year. Write for details. Exide Industrial Marketing Division, The Electric Storage Battery Company, Philadelphia 20, Pa.

Exide®

Circle 554 on postcard, page 33

Now! Skil Roto-Hammers drill 3½" holes in reinforced concrete

using new percussion carbide tipped Skil Core Bits!

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These hollow core, percussion type carbide bits increase the range of the Model 726 Roto-Hammer from 1⅛" up to 1½" and the Model 736 from 2" up to a full 3½"!

What's more, they drill right through stubborn steel reinforcing rods—an impossibility with solid carbide bits or star drills.

This means that the hammer that already drills masonry holes at the *lowest cost per hole* and with *lowest hammer maintenance*, has tremendous added versatility.

Ask your Skil distributor for a demonstration soon. Look under "Tools-Electric" in the Yellow Pages. Or write: Skil Corporation, Dept. 120H, 5033 Elston Avenue, Chicago 30, Illinois.

Skil Roto-Hammers combine power rotation with powerful hammering to drill holes in masonry (¼" to 3½") 5 to 6 times faster than ordinary electric hammers! Lowest maintenance--no springs to break.

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Circle 555 on postcard, page 33

SPACE SAVING heat-x PACKAGE CHILLERS

Greater cooling capacity with much less bulk . . . that's the story on this new line of Heat-X units for industrial non-corrosive coolant applications, chilled water air conditioning, and drinking water or cooling uses.

Completely factory assembled, these units are delivered prewired with all necessary controls. All Components perfectly matched for economical operation and efficiency. Check these features:

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- ✓ Chilled liquid passages non-ferrous construction thereby eliminating corrosion problems
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For complete specifications and engineering data request catalogs 8022A, 8023A.

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Multi-tube, extended fin surface design reduces space required for chiller yet produces high percent of heat transfer efficiency.

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Combine heating and cooling in single compact unit. Separate copper refrigerant circuit, copper or stainless circuit and heating element cast within aluminum block protect against "freeze-up" damage.

'IC' Inner-Fin Condensers 5 to 130 ton capacities
Patented Inner-Fin construction, Heat-X exclusive, provides most compact shell and tube condensers anywhere. Use less refrigerant and cut cost, yet maintain high percent of heat transfer efficiency.

'WIO' Water Cooled Inner-Fin Oil Coolers
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HEAT-X, Inc.
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HOW TO TAKE THE EDGE OFF A HEADACHE

KUTWELL® EP 66 is a new high-quality, water-soluble cutting oil designed to do the tough jobs—cutting special alloys and high-strength tool steels. Its powerful, extreme pressure agents take the toughest cutting, grinding, and drilling jobs in stride. Pieces per tool grind have jumped dramatically when Kutwell EP 66 was used instead of higher-cost specialty oils. Machine tool lubrication and rancidity control are effectively maintained.

FEBIS® K lubricants improve machining precision by eliminating troublesome "stick-slip" motion. Febis K lets the carriage proceed smoothly throughout its stroke; actually makes static friction less than sliding friction.

NEBULA® EP multi-use grease serves all grease-lubricated parts, even those which require extreme pressure properties. It does an efficient job at high temperatures and resists oxidation for long periods. Your Esso representative is an expert at curing all kinds of lubrication headaches. Contact him, or write us at 15 West 51st St., N. Y. 19, N. Y.

HUMBLE OIL & REFINING COMPANY Esso

Circle 557 on postcard, page 33

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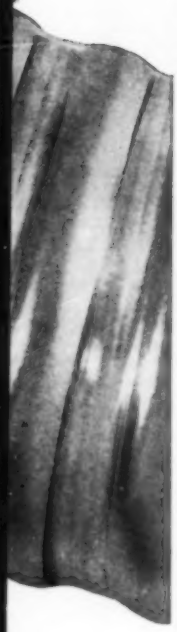
Cut corners with flexible USS Armorlokt Cable

Remember your last conduit job . . . all the time and work needed to install junction boxes, not for new circuits but just so the cable could be pulled around corners? And the longer the pull, the more boxes you needed. USS Tiger Brand Armorlokt Cable could have been installed in approximately one-half the time and eliminated all that expensive pipe fitting and bending. ■ Armorlokt installs as easily as ordinary cable—yet it protects as well as rigid conduit, and sometimes even better because Armorlokt is flexible and "rolls with a punch." You can install it anywhere . . . up, down, across walls, buried in the ground, suspended in trays or on cable rings, indoors or outdoors. Armorlokt can be installed in long lengths, because its flexible construction permits easy and quick bending around corners, I-beams, or any other obstruction. And you can easily splice into Armorlokt Cable, anywhere along the entire length. ■ Armorlokt has a higher current-carrying capacity than the same size conductor in conduit because heat is quickly dissipated, not trapped inside. Corrosive atmospheres are no problem. Armorlokt is available with galvanized steel, stainless steel, aluminum or bronze armor. It's also available with an Ampyrol (PVC) jacket, in black or colors for easy identification. You can order Armorlokt with almost any kind of insulation, including varnished cambric, rubber, or asbestos up to four inches in diameter, rated 15,000 volts. ■ There's a standard USS Tiger Brand cable for every special job. For the complete story on Armorlokt Cable or any other type cable, call our nearest sales office or write American Steel and Wire, Dept. 1228, Rockefeller Building, Cleveland 13, Ohio.



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An outstanding line of LOUIS ALLIS adjustable-speed drives from ½ to 2500 hp.

Louis Allis offers you a complete line of adjustable-speed drives with various characteristics for every application where adjustable speed is required.

Experienced Louis Allis field engineers, supported by regional and factory industry specialists, will help you select the best drive or drive system to meet *your* requirements.

The Louis Allis line of drives provides outstanding control features ranging from simple manual to precise electronic or transistorized control. Selection of control varies, of course, with the nature of the installation and the precision required. Where desirable, speed regulation as close as .1% is obtainable.

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For process plants or applications involving inter-related motors and multiple drives, Louis Allis engineers can provide complete "systems engineering," furnishing all electrical rotating components and control.

For expert assistance, call your local Louis Allis District Office listed in the Yellow Pages under "Electric Motors"... or write direct to The Louis Allis Company, 434 East Stewart Street, Milwaukee 1, Wisconsin. Ask for Bulletin 2900, "Louis Allis Adjustable Speed Drives."

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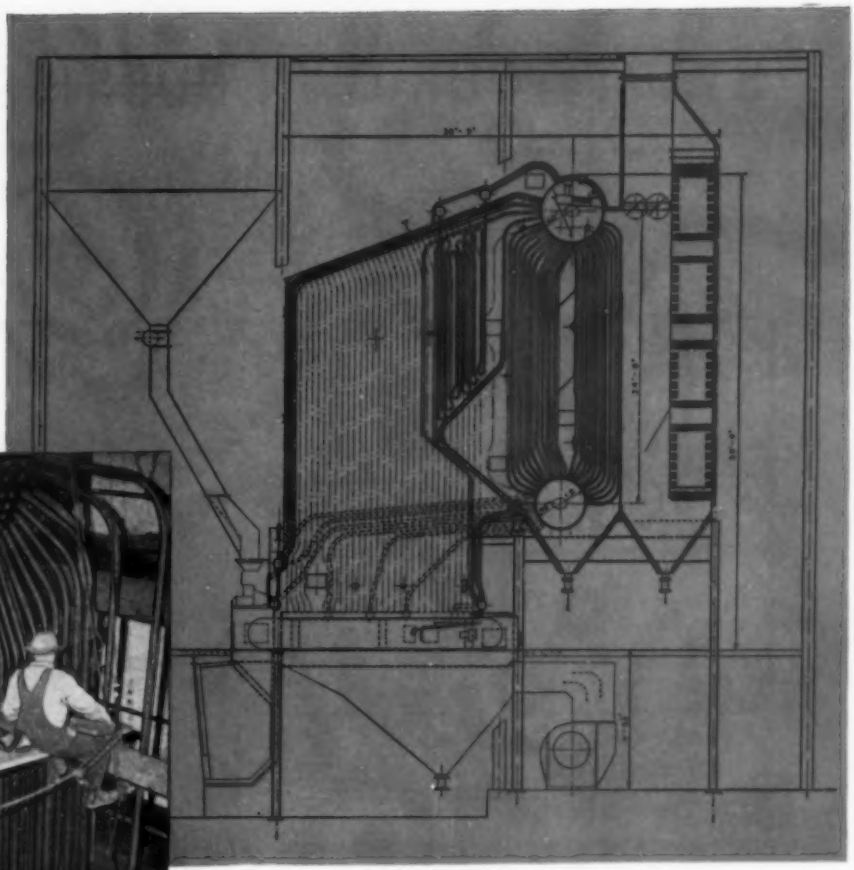
Circle 559 on postcard, page 33

430-238

Union Starch Installs a Modern Coal Fired Steam Generator



Longitudinal section through unit.

Tubes being installed in steam and water drums.

PROJECT BY
ROGERS SCHMIDT
ENGINEERING CO.
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This 125,000 pounds per hour capacity Vogt Steam Generator, especially designed to burn bituminous coal, serves the Granite City, Illinois plant of the Union Starch and Refining Company. The unit operates at 475 lbs. pressure and delivers steam at 750°F. total temperature. It has water cooled front, sides and roof of furnace and employs a spreader type coal stoker.

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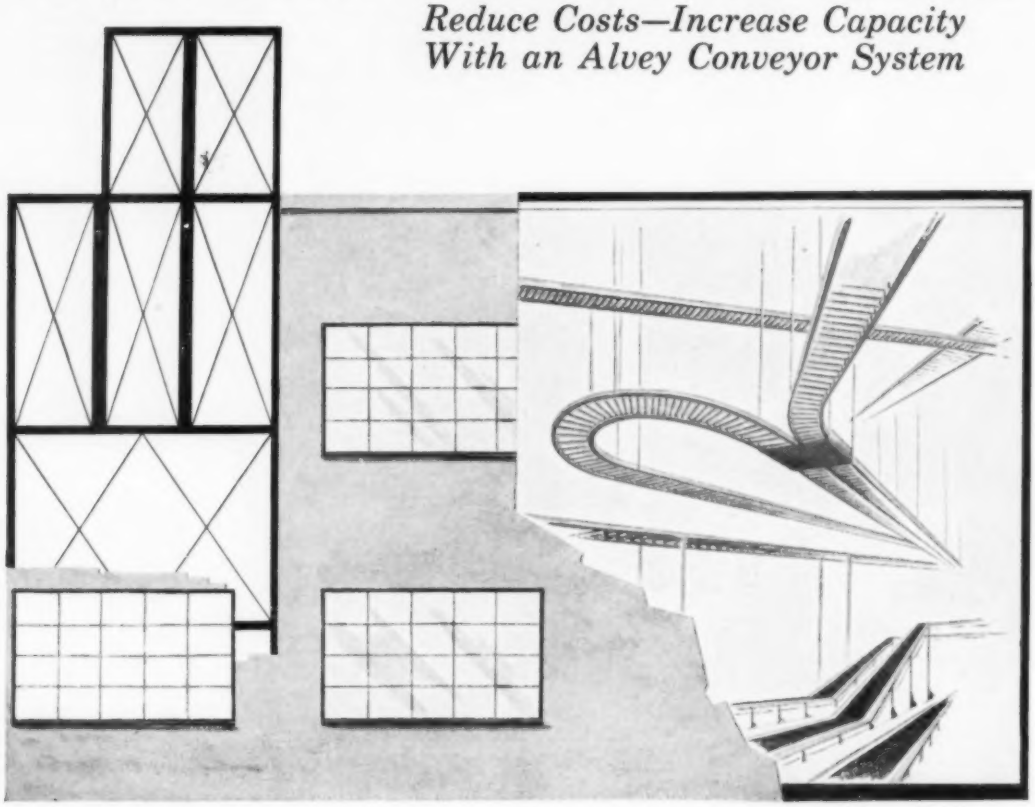
STEAM GENERATORS

Circle 560 on postcard, page 33

START YOUR OWN BUSINESS BOOM

Reduce Costs—Increase Capacity
With an Alvey Conveyor System



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MODERNIZATION

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Circle 561 on postcard, page 33

CONSTRUCTION BRIEFS – reviewing methods and materials for the plant engineer

Edited by H. E. B. Anderson

Fig. 1. Precast, rough top concrete slabs span steel framing to provide plant flooring. Here, panels are arranged for test at fabricating plant.

PRECAST CONCRETE FLOOR SLABS

IN THE DESIGN and construction of the new Gates Rubber Company plant near Nashville, Tennessee, the Rust Engineering Company specified precast concrete rough top floor slabs for floors which were installed on steel framing. These floors, used primarily in the Banbury building, covered an area of 120,000 sq ft.

The precast slab, developed by the Alabama Cement Tile Co., functions as the lower portion of a composite floor slab, and carries the necessary tension steel for the entire slab. Each unit measures two feet in width, is designed to span approximately seven feet between framing supports in the building, and is three and one-half inches thick.

At the site, the slabs were used as forms for the concrete which was poured on top of the slabs after their installation spanning the steel framing. They are finished with a very rough top, to provide a 100 per cent bond between the precast slabs and the poured concrete topping.

The slabs, which are bevelled on all top edges, were placed on supporting members with a gap of two or three inches between the ends of abutting slabs. A dap, cut into each slab end to fit over the beams and provide positive positioning, assured safety during erection and the flat undersurface provided continuous bearing at the supports.

Openings required for floor drains, conduits, etc., were cast into the slabs according to detail drawings worked out for the plant floor areas. Each slab was numbered and positioned in the floor according to a locating drawing.

Since the slabs were cast and vibrated in steel forms, their bottom surfaces are smooth, and present a pleasing ceiling appearance in the occupied areas under the floor.

In this job, the floor loading dictated a seven-inch floor thickness, so three and one-half inches of concrete were poured on top of the precast slabs to complete the floor. This particular floor is designed to support 500 pounds per square foot live load.

In addition to the tension steel in the precast slabs, reinforcing is placed in the poured slab to provide the negative steel for the composite floor slab.

The use of forming was eliminated, and no shoring was required—producing a saving of both time and money.

One of the advantages of this floor construction system is that the slabs can be installed immediately after the erection of the structural steel frame, to provide a surface on which other trades can proceed with their work. There is no delay due to forming or pouring of a conventional type of concrete floor. **End**

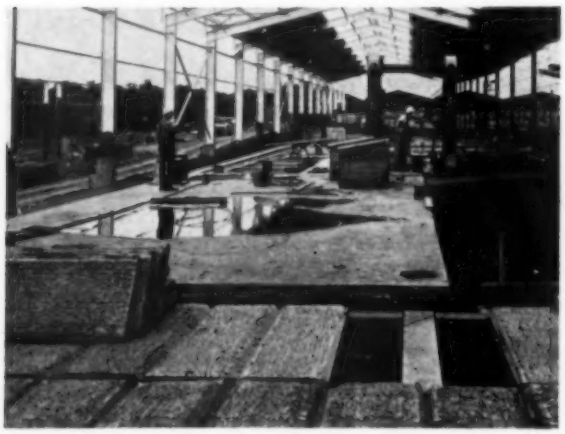
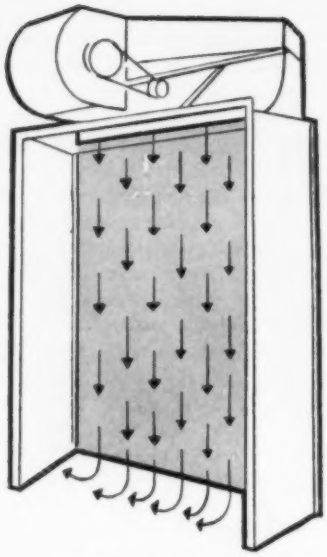


Fig. 2. At Gates plant, construction photo shows partially poured floor; slabs in foreground become concrete forms.

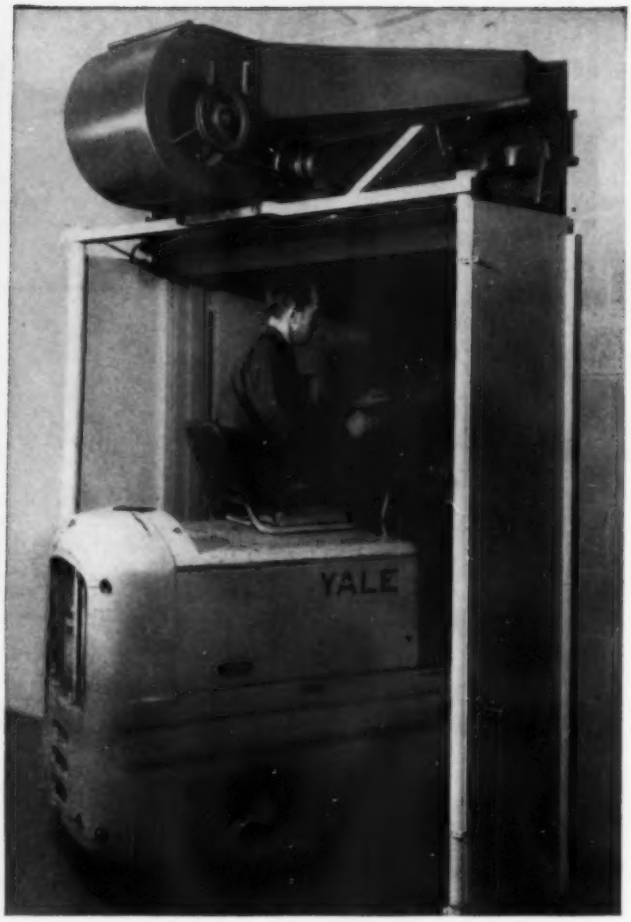
Fig. 3. Expanse of precast slabs illustrates use as temporary floor before permanent concrete floor is poured.

AIR ISOLATOR*

***opens** doorways to unlimited traffic*



Air Isolator is available for openings up to 8′ wide, 10′ high.



Traffic speeds through "open" door as Air Isolator immobilizes movement of air between the two areas.

***screens out** heat, cold, humidity, dust, odors, insects*

• AIR ISOLATOR is the proven and practical answer to high volume traffic problems between two areas of different temperature or humidity.

AIR ISOLATOR provides a high velocity curtain of vertical air across open doorways to form a shield between outside and inside air. During periods of heavy traffic, doors can be opened and left open. Traffic moves faster; dust, cold, heat, odors or insects are repelled; worker comfort is assured.

* registered trademark and product of Lehigh, Inc.

WRITE FOR INFORMATION

Complete data on the economical Air Isolator is yours for the asking. Write today to Jamison Cold Storage Door Co., Hagerstown, Md.

JAMISON
COLD STORAGE DOORS

Circle 562 on postcard, page 33

Problem: Paint jobs ruined by airborne dirt in spray booth

This plant needs make-up air! If the exhaust fans in your paint shop remove air faster than you replace it, they cause a vacuum. The vacuum sucks in dirt and dust every time a door or window is opened. Your plant needs make-up air...a supply of new air to replace exhausted air and cancel out vacuum.

Without make-up air, you get a chain reaction of vacuum problems. Violent cross drafts...Infiltration of dirty air or fumes from outside, and from one plant section to another ...Heat loss...Unhealthy workers... Low morale...Costly absenteeism.

Solution: install separate fans to supply make-up air. They cancel out the vacuum, give your plant balanced ventilation. These fans should be part of a complete make-up air system that tempers and cleans the incoming air.

For technical help on make-up air, see your Consulting Engineer. Or call in Sturtevant application engineers. They're experts in handling air...whether you want to move it, heat, cool or clean it. Mail coupon for booklet on make-up air. J-60709

WESTINGHOUSE ELECTRIC CORPORATION
Sturtevant Division, Dept. HE-09.
Hyde Park 36, Mass.

Send me your make-up air booklet.

NAME_____

TITLE_____

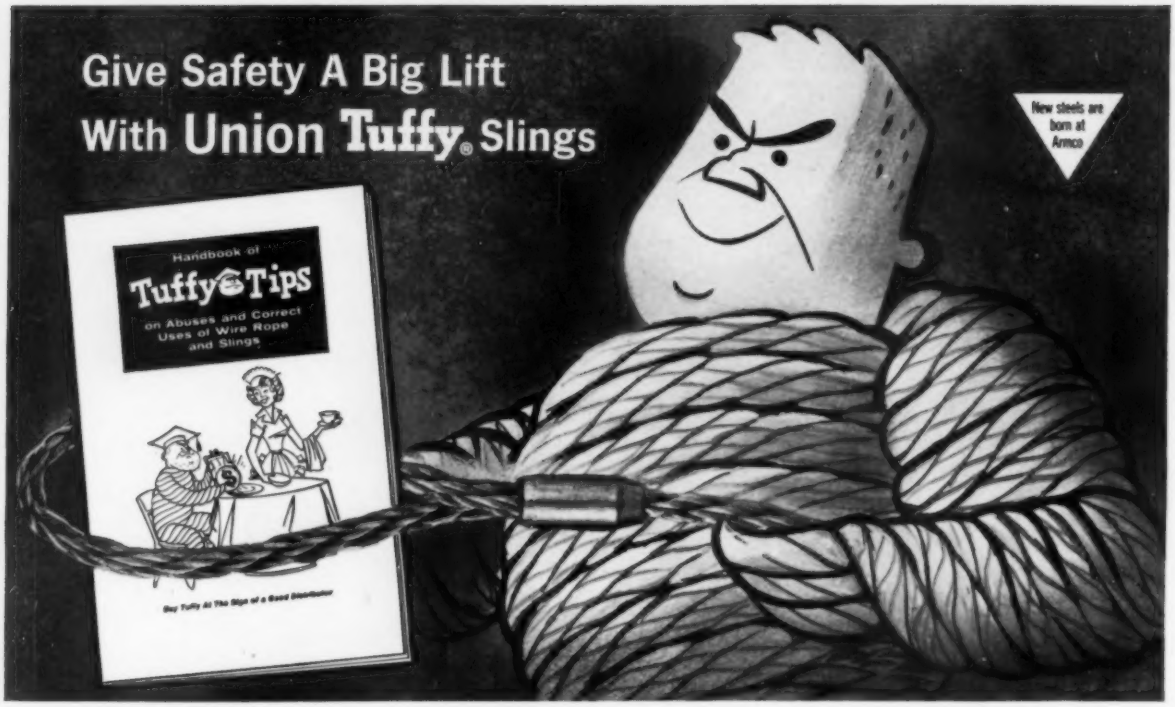
COMPANY_____

ADDRESS_____

PHONE_____

You can be sure...if it's **Westinghouse**

Circle 563 on postcard, page 33


Give Safety A Big Lift
With Union Tuffy® Slings
Handbook of
Tuffy Tips
on Abuses and Correct Uses of Wire Rope and Slings
New steels are born at Armco

Union's Tuffy has written a book. The purpose is to make a mental contribution to Safety—one that will supplement the physical safety factors Tuffy Slings have contributed through a unique combination of strength and flexibility.

The many Tuffy Tips in the book, on the proper use of slings and hoist lines, will prove almost as helpful in providing longer service as has the patented 9-part machine-braided wire fabric construction of Tuffy slings. Send for this book—no charge to sling users. See how Tuffy-Tips, Tuffy Slings and Tuffy Hoist lines work in hand-and-glove harmony to cut hoisting costs and down time in every kind of materials handling.

Four Special Union Wire Slings

In addition to famed Union Tuffy Slings, Union Wire Rope offers, in a full range of sizes:

1. **Hand Braided** six and eight-part slings.
2. **Uni-ply**—a flexible multi-part rope laid sling with pressed-on metal ferrule.
3. **Press-Grip** wire rope sling with pressed-on metal ferrule.
4. **Uni-Grip** wire rope sling with return loop splice and pressed-on metal ferrule.

Union Wire Rope Tuffy Tips on safe use of Slings and Hoists

Safety Council Cites Factors In Lifting Injuries:

The National Safety Council points out that nearly a fourth of all compensation cases are the result of unsafe handling, cautions against:

"(a) Handling loads that are too heavy; (b) lifting or lowering with back instead of leg muscles; (c) handling load with an insecure grip and failing to watch where hands are placed; (d) handling without sufficient help or failing to use mechanical equipment; (e) handling before getting a firm footing; (f) lifting or lowering with a jerking, twisting movement, or when the body is in an awkward position."

Free! Two Valuable Tuffy Handbooks

1. "Tuffy Tips." Many more safety hints. Tells how to get longer service from slings and wire rope. Chock-full of do's and don't's to save money.
2. "Tuffy Sling Handbook." Helpful data on the selection and use of slings —types, dimensions, weights, fittings, rated loads, safety-approved signals.

Write Union Wire Rope, Armco Steel Corporation, 2272 Manchester Ave., Kansas City 26, Missouri

4-61

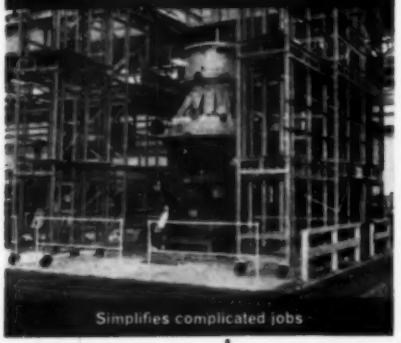
ARMCO Union Wire Rope

Circle 564 on postcard, page 33

HOW TO TIGHTEN UP ON FRAMING COSTS

Versatile as your ideas

Customizes at lowest cost



Simplifies complicated jobs

Acme Steel's AIM Brand Slotted Angle frames anything faster, easier, stronger . . . at less cost

Bring on any framing job—platforms, ladders, steps, work tables, benches, stands, conveyors, storage racks . . . even complete staging areas. Acme Steel Slotted Angle will tackle them all . . . complete them all with amazing speed, ease and material savings.

Simplicity is the secret. This rugged, galvanized steel do-all material is simply sheared to size with an AIM Brand Cutter and bolted together. The cutter and a wrench are the only tools needed. No drilling, sawing or welding. And Acme Steel's exclusive pattern of precision slots and holes aligns perfectly with opposite members. There's no figuring and finagling to fit pieces. Your men can master assembly in minutes. Obviously, manpower savings are tremendous.

AIM Brand's superior bolting pattern also gives you virtually unlimited design freedom, plus unparalleled structural rigidity.

All factors considered—initial cost, assembly savings, design versatility and 100% reusability potential—you'll come out way ahead with Acme Steel Slotted Angle.

Your local AIM Brand distributor can meet your supply needs from his stock, and can assist in many other ways. He's listed in the Yellow Pages under "Racks" or "Shelving."

ACME STEEL

IDEA LEADER IN

FRAMING

ACME STEEL COMPANY, Fabricated Materials Division, Dept. PED-81, 135th St. & Perry Ave., Chicago 27.

Please send me new 24 page book, "Creative Framing at Lowest Cost", illustrating plant-wide uses of Slotted Angle in standard length and new ready-to-assemble kits.

*Name*_____

*Title*_____

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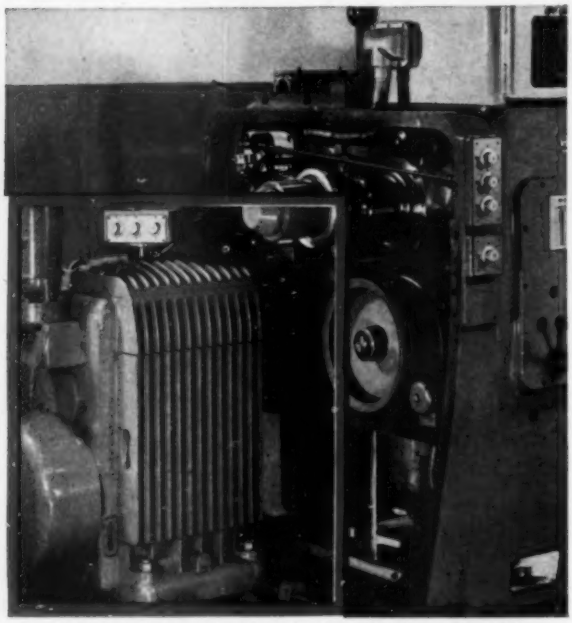
Circle 565 on postcard, page 33

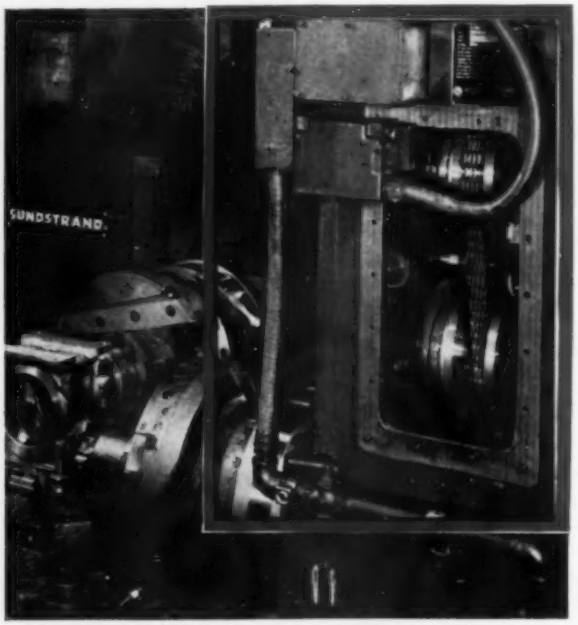
Only Link-Belt RS P.I.V. variable speed drives give you all three:

compact design
constant horsepower
capacities to 50 hp

Separately mounted . . . . . or built-in types



Link-Belt fully enclosed, motorized RS P.I.V. drive with automatic controls on a high-speed lathe. Horsepower and surface cutting speed are constant to suit turning and facing operations.



Two Link-Belt RS P.I.V. drives are built into this twin-head, right-angle automatic boring machine. The spindle in each head is individually controlled to meet the requirements of each operation.

Higher hp capacities in an extremely compact unit—that's what you get with Link-Belt RS P.I.V. variable speed drives. For direct-drive variable speed transmission, these units provide smooth, stepless speed control—precisely and infinitely variable over the entire range from maximum to minimum settings.

With capacities up to 50 hp, Link-Belt RS P.I.V. drives offer speed variation ratios as high as 7 to 1. During many years of service they have proved their dependability in heavy-duty industrial installations . . . and in systems involving automatic control or programming. Construction is all-metal, with dependable oil lubrication.

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RS P.I.V. VARIABLE SPEED DRIVES

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Warehouses, District Sales Offices and Stock Carrying Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs; Switzerland, Geneva. Representatives Throughout the World.

Circle 566 on postcard, page 33

WHY TWO STANDARDS FOR LIGHTING?

Office lighting in modern industrial plants is usually of good quality and generally meets the minimum footcandle recommendations of the Illuminating Engineering Society. However, when we move out into the plant areas, we find an entirely different environment. Footcandle levels are generally much lower, although visual tasks might be much more difficult. Glaring, bare lamps are everywhere and little effort is made to shield them.

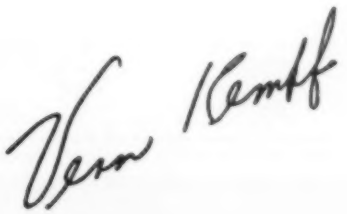
Depending upon the task, footcandle levels in plant areas should be equal to or higher than those found in offices. As an example, minimum recommended levels for medium assembly or machine work is 100 fc. For fine assembly or machine work, 500 fc is required for adequate seeing. Difficult inspection tasks also require 500 fc. At these higher levels, it is even more important to control brightness by well designed louvers to create comfortable seeing conditions.

In face of these recommendations, why do plant engineers settle for lower footcandle levels and glaring luminaires (that would be totally unacceptable for office areas) in plant areas? Scribed lines on layouts, vernier calibrations on machines and fourth carbon copies of orders are all harder to see than the neatly typed letters found in office work. Not only are visual tasks more severe in plant operations, but mistakes resulting from poor seeing conditions are usually more expensive.

If we can agree that there is little significant difference between the eyes of plant and office workers, we have taken a long step forward in eliminating this double lighting standard.

Equipment is available. Many commercial luminaires can be used effectively in assembly manufacturing occupancies. Even the rugged industrial fluorescent luminaire can be equipped with louvers to provide adequate shielding and increased comfort. Study your own situation carefully and then start a personal battle to get the same kind of seeing conditions for plant workers that is almost automatically supplied for office workers.

Illumination levels should be based strictly on the task to be performed, regardless of plant or office location. When evaluating luminaires, glare rating should receive top priority to insure maximum comfort. When these factors govern your lighting design, rather than plant or office location, we will have made a big step forward in stamping out the double standard for lighting in American industry.



ONE OF A SERIES OF CHATS ABOUT CONSERVATION AND CONTROL OF HEAT

SARCO TOPICS

SO YOU THINK YOU'VE GOT TEMPERATURE CONTROL PROBLEMS

When plant men get together and talk about their temperature control problems, strong men may weep. It's so darned basic—that narrow range of degrees which must be maintained—so closely allied to profit and loss. Let us tell you about one situation that may even top yours, and may clue you in on a good solution. It concerns wine, of all things.

Take those basic temperatures. Wine must be pasteurized at 140°F. Those are the facts of life in the world of wine. They might not seem too difficult to live with unless you are concerned with heat. Then you probably know how tough things can get when you have a rendezvous with a thermometer.

Take New York's Monarch Wine Company, producers of Manischewitz Wines. Their Problem: how to maintain the 140° temperature in the heat exchangers despite wide variations in the rate of wine flow. These variations, between 5 to 60 gallons per minute, result from slowdowns and recoveries in the bottling process. Problem: entire system must be capable of complete shutdown when necessary. Problem: wine temperatures must be raised to 140° as rapidly as possible, sometimes an immediate jump of 100°.

Attracted perhaps by aspects of the situation that had little to do with pure science, Sarco engineers applied the collective experience of Sarco technology to the solution of this serious problem. The result for Monarch: the *degree of control* the process demanded—achieved through the excellent use of Sarco Temperature-Pressure Regulators, Float Thermostatic Steam Traps Thermo-Dynamic Steam Traps, and Pipeline Strainers.

Sarco engineers, ever resourceful, divided each of the two large Cherry-Burrell plate-type heat exchanger units into two separate

sections with a blank baffle plate, each with a separate Sarco control. Thermal sensing bulbs were installed in wine discharge and throttling controls hooked into steam supply. As demand fluctuates, one or both regulators function to maintain the 140° temperature. In higher demand, both regulators are operative; as demand drops and flow decreases, only one regulator supplies steam. Pasteur himself would have been elated.

Each of six smaller capacity shell-and-tube heat exchangers required only one regulator, with the sensing bulb inserted into the outlet side of the wine filled shell, and the regulator throttling steam supply to the tube section. Thus, by controlling flow of steam to the exchangers on the basis of pressure and temperature, the Sarco regulators were able to maintain the temperature of the wine at precisely 140° regardless of fluctuations in demand or supply rate. Whew! A lot of engineering went into those two sentences.

From here on it's downhill. To secure complete cut off of the steam supply during scheduled shut-downs of the bottling run, solenoid valves were provided to supplement normal modulating action of the controls. To discharge widely varying loads of condensate continuously and remove immediately all air and incondensible gases, Sarco Float Thermostatic Steam Traps were installed on all condensate outlets. On the drips before each control valve a Sarco Thermo-Dynamic Steam Trap was installed to insure delivery of dry steam. Sarco Pipeline Strainers were installed before all steam traps and valves to protect them against damage by any foreign bodies. And thus ends a classic story of the grape.

Still, this story has been condensed far too much, really, and we feel you've been cheated out of the story's more delicious details. You needn't be, however. We've printed the facts in detail for posterity and you in Sarco Case History 185, complete with drawings that practically make it a do-it-yourself kit. If you would like a copy, we will be flattered to receive your request, and dispatch it with dispatch.

WE'RE ALWAYS IN... AND THE WELCOME MAT'S OUT

We always take it for granted that if you are going to be in the vicinity of our plant you'll phone or drop us a line so we can invite you to visit us. You'll find that our factory in Bethlehem, Pennsylvania, is on many well-travelled routes, and that our steam laboratory has much to offer in interest and helpfulness. Forgive us for being immodest, but the lab is the most up-to-date of its kind in the country.

When you visit us, don't allow yourself to get sidetracked by the drill presses and automatic lathes. We're proud of this equipment but you've probably seen metal mutilated before, and it's our steam laboratory that's unique. We promise you a good show, and if you have any problems, bring them along. We'll solve them while you wait.

ANYONE FOR KEY CHAINS?

Need a key chain? A tiny replica of a Sarco Thermo-Dynamic Steam Trap, Type TD-50 is attached but you can always remove it if you find it too commercial. There are many things you could use these chains for. Fishing sinkers? Lengthening a light cord? Even holding keys? Anyway, if your Sarco representative is out, write in.

Pardon our monopolizing the conversation in this series of paid communiques, but we're trying our best to interest you in certain subjects that concern us both—to the point where you'll communicate.

6355

SARCO

SARCO COMPANY, INC.
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PLANT: BETHLEHEM, PA.

STEAM TRAPS • TEMPERATURE CONTROLLERS
STRAINERS • HEATING SPECIALTIES

Circle 567 on postcard, page 33

WHAT'S JUST AHEAD IN THIS ISSUE

- SEVEN BASIC FUNDAMENTALS can adequately guide your selection of cloth dust filters. Application is another thing—be sure that your plant system fits the material being handled. Recommendations for various applications are included in the article starting on the next page.

- IS UNUSED MACHINERY wasting space in your plant? If so, consider the "moth-balling" technique being used at Western Electric's Baltimore Works. A protective coating, sprayed on idle equipment, permits its storage outside. Result: more plant operating space available. For all the details, turn to the article "Equipment Gets Tough Hide for Outdoor Storage" on page 98.

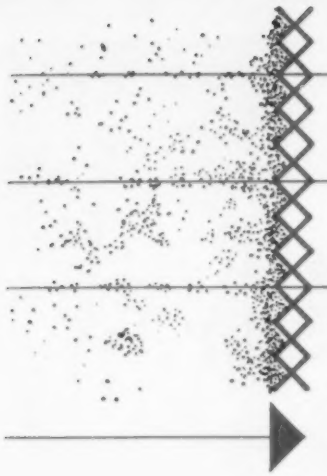
- WHY BOILER water treatment? What is corrosion fatigue? What are the methods of preventing caustic embrittlement? What are the advantages of internal treatment? These and 22 more questions are answered in the article beginning on page 100. It is intended to contribute to a better understanding of boiler water problems.

- EMERGENCY PIPE repairs can be a snap with the right equipment. The right equipment—a variety of lengths and sizes of precut hose sections. By having these ready-made hose lengths available, Uranium Reduction has greatly reduced process downtime. They have also used them in temporary pipe changes. To see how it's done, turn to page 107.

- INSTRUMENT AIR that is not clean and dry is trouble looking for a place to happen. The article on page 115 points out the features of three filtering and drying systems that will avoid such trouble. Perhaps one of them will fit your air supply operation.

- PLANT ENGINEERS at Lockheed's Marietta plant have put standby power "on call". Since they outfitted two trailers as mobile generating units, there are no long shutdowns because of power failure. Now, when a circuit fails, they just move one or both units to the trouble area and tie in. The full story is on page 118.

- HOW MUCH LIGHT is right? According to the author, a number of plant operations should have more than is presently available. The article starting on page 125 further emphasizes the points discussed in the editorial comment on the preceding page, giving some specific locations in the plant area where lighting should be improved.



Selection Application and Maintenance of CLOTH DUST FILTERS

By **R. L. CLEMENT**, District Manager and former Chief Engineer
The W. W. Sly Manufacturing Co.
Detroit, Michigan

THERE ARE many types of dust filters—flat bag dust filters, tube dust filters, mechanical shaker dust filters, reverse air cleaning dust filters, and sonic cleaning dust filters. Each of these have many variations in design and principle and each have a place in industrial ventilation. The selection and choice is entirely up to you—the user.

From a few industries, the list of dust filter users now includes nearly all industries. Yet in all these varied uses, the fundamentals of application are few, and apply to all of them. If applied properly there is no reason why every cloth dust filter used cannot be a satisfactory installation. Such dust filters should not be subject to blinding, hand cleaning, washing of bags, excessive bag wear, etc.

The basic fundamentals to be considered in the selection of a cloth dust filter are:

1. Air, or gas
2. Temperature
3. Humidity or moisture
4. Dust particles in the air, or gas
5. Ratio of air or gas to cloth. (The number of cubic feet per minute passing through a square foot of filtering cloth.)
6. Pressure drop across filter
7. Cloth

Some are more important than others and must be given more attention. However do not overlook or dismiss any of them. Consider them one at a time and in relation to each other.

In every ventilating system the air or gas is the vehicle used to suppress dusting at its source, and to carry the dust particles to the dust filter. It is of prime importance that enough air or gas be designed into your system. Determining this volume is the first step in arriving at the proper size of the dust filter. It is the prime factor in having a satisfactory ventilating system. It will also determine the cost of dust filter equipment. The more air to be handled, the more costly the system.

All air or gas has a temperature. The maximum that can be handled in a filter using standard cotton bags is 180 F. Other materials allow the use of higher temperatures.

An application using ambient air has no problem involving temperature. Once it appears that other than ambient temperatures are involved, then by all means a closer look at this factor is indicated.

Watch Out for Moisture!

With the higher temperatures, moisture or humidity come into the picture. This condition is critical to the application of the dust filter and must be approached with care. As a general rule, moisture, dust and cloth are not compatible. However, under certain guaranteed conditions satisfactory operation can be attained.

In such cases it is necessary to first determine the dew point of the air or gas entering the dust filter. This must be based on the lowest operating temperature of the dust filter. The recommended rule is to have, at all times during operation, at least 50 F difference between dew point and actual operating temperature.

You should design into your system a positive means of control to insure this. It can be done by various means such as heaters, bleed-in of dry air, etc. As long as the means has positive control it will work. In addition, insulate filter case.

Some of you are probably thinking: Why such a spread between the dew point and operating temperatures? Perhaps I can explain it in this manner. You have at some time or other been driving your car down the road in apparently clear atmosphere. Yet your windshield, your radio antenna, and your side-view mirror will have moisture droplets on them. It is caused by the impact of moisture laden air on these objects.

The same thing happens in your piping and dust filter. The air moving at a velocity impinges on the pipe, case, and bags. If the dew point is close to the operating temperature, some moisture will be deposited on these parts by impact. Experience has shown that with a spread of 50 F or more, this does not happen. Be very careful of moisture.

In operation it is necessary to make certain that the temperature and moisture conditions be as they were designed. Never take for granted that they are. A small amount of condensation can cause plenty of grief. A wet and dry bulb thermometer is all that is needed for this check. The period of operation most likely to cause condensation is at startup of the ventilation system and at shutdown. A few simple precautions can reduce the possibility of condensation occurring at these periods.

Before starting any operations that are to be ventilated and may create dust, start the fan. If the operating

temperatures are higher than ambient, furnish heat to the air stream. Allow enough time for the temperature of the filter case and bags to rise fairly close to the operating temperature, before admitting dust to the system. This will tend to purge the filter and bags of any moisture that may have collected during the period the filter was shut down.

When shutting down the system, turn off the equipment creating the dust. Let the fan run slowly until the temperature of the case and bags have reached ambient temperatures. This also will purge the entire system of moisture laden process air and prevent condensation.

If the ambient temperature is subject to wide ranges of change while the filter is shut down, it may be necessary to provide some means for a continued amount of heat to be supplied to the filter case at all times. A small electric unit heater with a fan is usually sufficient for this.

Neither the dust particle itself, nor the quantity of them in the air stream need be considered. Normally they affect only the frequency of cleaning. It is only when they fall into either of two categories, that they effect the application of the dust filter. These are hydroscopic dusts, and those classed as sticky dusts.

The former is the type of dust that will pick up moisture from the surrounding atmosphere. These must be treated with special care. Operating procedures outlined previously for moisture and humidity must be followed, even though there are no temperatures involved. In addition, the bags must be thoroughly cleaned at the end of each shutdown period, even if this period is only for a few hours.

Sticky dusts tend to adhere to each other and to other materials. This may be because of shape, generation of static electricity, or because of their chemical makeup are never completely dry. These dusts are very difficult to handle and every effort should be made to keep dust loading to the minimum. Cleaning periods should occur more often than with other dusts and the most efficient cleaning devices should be used. These dusts also influence the size of the dust filter. A much lower ratio than normal must be used.

The ratio of air to cloth is the most important factor in the application and selection of a dust filter and has a direct bearing on the size of the dust filter chosen. Let us assume in explanation, that a ventilation system has been designed requiring air at 10,000 cfm. If a ratio of 2:1 is chosen, let us say the filter is 16 ft long. If instead, a ratio of 4:1 were chosen, the dust filter would only be eight feet long, with all other dimensions remaining the same. You can readily see that there would be a big difference in the cost of the two units.

Low Ratios Recommended

From an operational viewpoint, it is impossible to use a ratio that is too low. If every dust filter was operated at a ratio below ½ to 1, they would operate satisfactorily for years. Unfortunately such is not possible from an economical viewpoint. There must be, then some common ground where the two viewpoints meet.

The table lists some 58 representative dusts that are most commonly handled in cloth dust filters. These are only a few of hundreds, and each can be broken down into a number of different categories. This list gives information on maximum ratios of air to cloth, pipe velocities and pertinent information regarding auxiliary equipment to be used in the sys-

Tabular material starting below and continuing on following pages shows the recommended ratios of air to cloth and pipe velocities for various applications.

RATIOS OF AIR TO CLOTH RECOMMENDED FOR VARIOUS APPLICATIONS OF CLOTH DUST FILTERS

The following information is based on dry dust and air with only the moisture content of the surrounding atmospheric humidity. Some applications of these dusts will necessitate lower ratios and in some cases higher velocities in the branch lines. Excessive moisture and temperature can void all of these recommendations and in such cases each application should be treated with extreme care.

Some of you will probably know of applications that are operating at higher ratios than listed. But are they operating in a satisfactory manner? Staying at, or below these recommended ratios will certainly lower the possibility of trouble developing.

ALUMINA:	**Use a ratio of 2.25:1 and a branch pipe velocity of 4500 fpm.**
ALUMINUM OXIDE:	**Use a ratio of 2:1 and a branch pipe velocity of 4500 fpm.**
ABRASIVES:	**Use a ratio of 3.0:1 and a branch pipe velocity of 4500 fpm.**
ASBESTOS:	**Use a ratio of 2.75:1 and a branch pipe velocity of 3500 to 4000 fpm—a preliminary cyclone collector, and special hoppers with large gates or valves should be incorporated in the ventilation system and dust filter.**
BUFFING WHEELS:	**Use a ratio of 3 to 3.25:1 and a branch pipe velocity of 3500 to 4000 fpm—a preliminary cyclone collector, flame-retardant cloth and a spark arrester are recommended.**
BAUXITE:	**Use a ratio of 2.5:1 and a branch pipe velocity of 4500 fpm.**
BAKING POWDER:	**Use a ratio of 2.25:1 to 2.5:1 and a branch pipe velocity of 4000 to 4500 fpm.**
BRONZE POWDER:	**Use a ratio of 2.1 maximum and a branch pipe velocity of 5000 fpm.**
BRUNSWICK CLAY:	**Use a ratio of 2.25:1 and a branch pipe velocity of 4000 to 4500 fpm.**
CARBON:	**Use a maximum ratio of 2:1 and a branch pipe velocity of 4000 to 4500 fpm.**
COKE:	**Use a ratio of 2.25:1 and a branch pipe velocity of 4000-45000 fpm. Pressure relief provisions, grounded bags, and special electricals (II G) are recommended.**
CHARCOAL:	**Use a ratio of 2.25:1 and a branch pipe velocity of 4500 fpm. Pressure relief, grounded bags, and special electricals (II G) are recommended.**

tem. These ratios have been compiled, based on actual experience from field installations and laboratory tests.

Perhaps some of you will take exception to these, and perhaps rightly so. You will no doubt know of many dust filters operating at higher ratios. But are they operating in a satisfactory manner? I do not mean that these ratios as listed should be used as a hard and fast rule. Use them as a starting point and as a guide. By not exceeding them, your chances of having an unsatisfactory installation will be practically nil.

Some of the difficulties of operation caused by high ratios are: High pressure drops across the filter, blinding of the cloth, and rapid wear of bags. One or all of these conditions occur at a given ratio regardless of dust loading, cloth, or the efficiency of the cleaning mechanism.

A high pressure drop across the filter is caused by the energy required to pull the air through the interstices of the cloth, at high velocities. You use practically the same principle in the design of piping. The higher the velocity, the higher the resistance. As an example—a piece of cotten sateen cloth with 104 by 68 threads per inch has a resistance of only 25 in. at a ratio of 2:1. At a ratio of 6:1, resistance would be nearly 1.5 in. wg.

Culprit: Velocity Impact

Resistance is not proportional to the velocity any more than it is in piping. Although until ratios of 4:1 or more is reached it can be nearly so. A cloth that is more porous will naturally have less resistance, but its filtering efficiency is also much lower. Keep in mind that resistance is paid for in fan horsepower requirements and higher maintenance costs.

High ratios will cause blinding of the cloth. The reason can be stated very simply. It is velocity impact of dust particles on and into the filter cloth. Imagine if you will, a screen on a window. When I was a boy we liked to throw mud at these screens. The game being to have the handful of mud stick to the screen, but when thumped, fall off leaving all the interstices open. The trick was in the velocity at which the mud hit the screen. If too slow it would not stick to the screen at all. If too fast, it would stick, but when thumped, although most of the mud came off, the interstices of the screen would be filled.

This is exactly what happens when the air-conveyed dust hits the filter cloth. If the velocity is very slow, most of the dust will not even get to the cloth. It too fast, the particles will imbed themselves in the cloth, and although most of the dust is removed from the surface, the interstices of the cloth will be full. This then is blinded cloth. When this occurs the pressure drop across the cloth will tend to rise and drive more particles even deeper.

Once blinding starts it will snowball. As the free area of the cloth becomes less, the fan tries its best to pull more air through a smaller area. This drives the ratio higher, with a resulting higher pressure drop, until the cloth is completely blinded. The pressure drop can become so high that the entire energy of the fan is used to overcome the static and none is used to convey air. In other words a condition is reached similar to that of a blanked off inlet of a fan.

Keep in mind that as the pressure drop across the dust filter increases, the volume of air from your points of ventilation decreases. As a result, dusting occurs, pipes fill up, and your management becomes very unhappy from the complaints of your operating people.

High ratios can also cause premature wear on the bags. The higher the ratio, the higher the velocity of air and dust particles hit the cloth, the more abrasion occurs. This area is usually a relatively small portion of the bag. Of what use is a filter bag with a small hole worn in it even though the rest of the bag may be in very good condition and show no signs of wear?

Low ratios in a filter will help to eliminate crusting of hydroscopic dusts. As an example, let us consider fertilizer dust being ventilated from a bagging station. At a ratio of less than 2.4:1, cotton bags will last for years without crusting or blinding. At ratios above 2.4:1, crusting of the bags and blinding will occur within a few months.

The following example best explains it. Have you ever noticed a sidewalk in the winter time? At dusk of a day when the temperature has been above freezing, the walk can appear wet. The next morning when the temperature is below freezing, the walk appears to be dry. If you looked closely you would see thousands of frozen water particles but there would not be enough of them to cover the complete surface of the walk. You know what the walk would be like if it were covered with, say ⅛ in. of water. The ice would be solid.

The same principle applies to dust particles on the filter cloth. If the permanent dust coating is thick, crusting can and will occur. If the dust coating is very thin, crusting takes place to some extent but does not cover the entire surface of the cloth. Openings are still free, through which air will pass in a normal manner. You will also find that this small amount of crusting occurs on top of the cloth fibers and not in the interstices. With low ratios of air to cloth you do not have the heavy permanent dust load on the cloth as you do with high ratios.

Applications Prove Point

Let me cite some other examples. One of the large aluminum companies had several dust filters of different makes and types. All of them were handling identical conditions and material. Those that were installed with ratios above 2.25:1 were a continuous source of trouble, resulting in pressure drops in excess of six inches, rapid bag wear, and eventual blinding of the cloth. Hand cleaning was necessary at least once a week from the very start. Those operating at ratios of less than 2.25:1 have never given trouble.

A large cement company had purchased dust filters for handling finished cement dust for years. Ratios were from 3.25:1 to 3.5:1. In every case they were a source of trouble and high maintenance costs. A few years ago they were finally convinced high ratios were causing their troubles. They purchased a few dust filters at ratios 2.5:1; their troubles ceased. Maintenance costs went down. They now have gone the other way. All cloth dust filters are purchased with at least 15 per cent additional cloth.

A well-known chemical company purchased two large dust filters from different manufacturers. Both to op-

RECOMMENDED RATIOS OF AIR TO CLOTH (continued)

COCOA: Use a ratio of 2.25:1 and a branch pipe velocity of 4000 fpm. Grounded bags, pressure relief provisions, sprinkler fittings, special electricals (II G) are recommended.

CHOCOLATE: Use a ratio of 2.25:1 and a branch pipe velocity of 4000 fpm. Grounded bags, pressure relief provisions, sprinkler fittings, and special electricals (II G) are recommended.

CORK: Use a ratio of 3:1 and a branch pipe velocity of 3000 to 3500 fpm. Special hoppers with large gates or valves, pressure relief provisions, and flame-retardant cloth, are recommended.

CERAMICS: Use a ratio of 2.5:1 and a branch pipe velocity of 4000 to 4500 fpm.

CLAY: Use a ratio of 2.25:1 and a branch pipe velocity of 4000 to 4500 fpm.

CHROME ORE: Use a ratio of 2.5:1 and a branch pipe velocity of 5000 fpm.

COTTON: Use a ratio of 3.5:1 and a branch pipe velocity of 3500 fpm. Preliminary centrifugal cyclone collector, flame-retardant cloth, special large hopper and valves, and pressure relief provisions are recommended.

COSMETICS: Use a ratio of 2:1 and a branch pipe velocity of 4000 fpm.

CLEANSER: Use a ratio of 2.25:1 and a branch pipe velocity of 4000 fpm. Pressure relief provisions, flame-retardant cloth, and grounded bags are recommended.

FEEDS AND GRAIN: Use a ratio of 3.25:1 and a branch pipe velocity of 3500 fpm. Pressure relief provisions and special electricals (II G) are recommended.

FELDSPAR: Use a ratio of 2.5:1 and a branch pipe velocity of 4000 to 4500 fpm.

FERTILIZER: (Bagging operations) Use a ratio of 2.4:1 and a branch pipe velocity of 4000 fpm.

FERTILIZER: (Cooler, dryer) Use a ratio of 2.0:1 and a branch velocity of 4500 fpm.

FLOUR: Use a ratio of 2.5:1 and a branch pipe velocity of 3500 fpm. Pressure relief provisions and special electricals (II G) are recommended.

FLINT: Use a ratio of 2.5:1 and a branch pipe velocity of 4500 fpm.

GLASS: Use a ratio of 2.5:1 and a branch pipe velocity of 4000 to 4500 fpm.

GRANITE: Use a ratio of 2.5:1 and a branch pipe velocity of 4500 fpm.

GYPSUM: Use a ratio of 2.5:1 and a branch pipe velocity of 4000 fpm.

GRAPHITE: Use a maximum ratio of 2:1 and a branch pipe velocity of 4500 fpm.

IRON ORE: Use a ratio of 2:1 and a branch pipe velocity of 4500 to 5000 fpm.

IRON OXIDE: Use a ratio of 2:1 and a branch pipe velocity of 4500 fpm.

LAMPBLACK: Use a maximum ratio of 2:1 and a branch pipe velocity of 4500 fpm.

LEATHER: Use a ratio of 3.5:1 and a branch pipe velocity of 3500 fpm. A preliminary cyclone collector and special hopper valves or gates are recommended.

CEMENT—

CRUSHING: Use a ratio of 1.5:1 maximum and a branch pipe velocity of 4500 fpm—a preliminary classifier section is recommended. Insulate case of filter.

GRINDING: (Separators, cooling etc.): Use a ratio of 2.25:1 maximum and a branch pipe velocity of 4000 fpm.

CONVEYING: Use a ratio of 2.5:1 and a branch velocity of 4000 fpm.

PACKERS: Use a ratio of 2.75:1 and a branch velocity of 4000 fpm.

BATCH SPOUTS: Use ratio of 3:1 and a branch velocity of 4000 fpm.

erate at a ratio of 4:1. From the first day of operation they were a source of trouble. Maintenance costs were about $7000 per year, not counting production losses.

Three years ago they purchased a third unit at a ratio of 2.5:1. Only a few dollars has been spent on maintenance, and these for inspection and greasing of bearings. In addition there has not been any lost production because of the dust filter being inoperative.

Operating ratios of a filter can be misleading. Let us take for instance a dust filter that must operate continuously day in and day out. Let us assume it is a shaker type dust filter. This means that the flow of air to some of the cloth must be cut off while the cloth is being cleaned. A filter of this type is made in compartments for this purpose.

While one compartment is shut down for shaking, the entire volume of air normally handled by this cloth must be channeled through the remaining compartments. The ratio of air to cloth will then rise in these compartments. The more compartments to the filter, the less the rise.

For example, let us consider a dust filter for handling 12,000 cfm on a continuous basis. A ratio of 2:1 is selected and a four compartment filter is chosen. Based on the operating ratio of 2:1, each section would have 1500 sq ft of cloth. With all compartments in operation the ratio would indeed be 2:1.

But, let us shut down one of these compartments for cleaning. The 12,000 cfm is then channeled through the remaining 4500 sq ft of cloth, raising the ratio to 2.67:1. It takes an average of four minutes to clean a compartment, and each is cleaned once per hour. This means that the

CLOTH DUST FILTERS

filter is operating an average of 16 minutes each hour at a ratio of 2.67:1 instead of the correct ratio of 2:1. If this were a critical dust, and 2:1 ratio was the maximum for satisfactory operation, the filter would eventually blind.

I do not mean to imply that compartment filters should not be used. I am only trying to point out that operating ratios can be misleading, and the filter should be sized to give the maximum ratio when the minimum area of cloth is available for use. For the filter in the example, with a maximum ratio of 2:1, a filter having 8000 sq ft of cloth should have been chosen.

In a number of years of evaluating poor operation in all makes and types of dust filters, I have found that they all had one thing in common. A high ratio. Do you not find this same condition in your plant? It is far more economical to add cloth before a dust filter is installed, than afterwards. Roughly speaking, the difference in cost per square foot of cloth added would be nearly 40 per cent.

Cloth in itself has little or no bearing on the size of a dust filter. Its choice depends on the service demanded. Cotton being the cloth most commonly used and the least expensive. However, for certain chemical and temperature requirements, special cloths are available.

Some of these cloths will stand short periods of higher temperatures than given above, but for constant operation it is not wise to exceed those temperatures listed in the table below:

Material	Maximum Operating Temperature	Chemical Resistance
Cotton	180 F	Neutral
Dacron	250 F	Acid
Dynel	180 F	Acid and alkali
Nylon	230 F	Alkali
Orlon	250 F	Acid
Wool	220 F	Acid
Glass	550 F	Acid and alkali

The startup of a new dust filter can be most critical. In fact it is possible to blind the cloth in a new filter before it has operated more than a few hours or days. Not because it has been improperly sized, but because certain precautions were not taken during the startup.

Correct procedure requires nothing more than the installation and use of a blast gate between the dust filter and the fan. Why is this necessary? Simply to induce artificial resistance in the system.

Let me explain. We will take as an example a ventilation system designed with 3-in. static pressure in the ducts and hoods. Another 3.5-in. static pressure is added for the dust filter, calculating that this will be the maximum pressure drop when the cloth has its permanent dust loading. The filter is to handle 8610 cfm at a ratio of 2.5:1. This is maximum. The fan is selected to handle 8610 cfm at 7-in. static pressure allowing ½-in. static pressure for fan pipe and fan exhaust piping. The fan selected would turn at 893 rpm, and require a 15-hp motor.

When the system is started up without a blast gate, the pressure drop through the dust filter would only be 0.5-in. static pressure. The system total, or the static the fan must overcome would be 4-in. static pressure. The fan turning at a given revolution per minute for other conditions, in order to balance itself out, would increase the cubic feet handled per minute. This increase would raise the resistance through the entire system due to the increase in velocity. Most of this increase would be in the ducts. The leveling off would be somewhere in the neighborhood of 11,700 cfm at 6.15-in. static pressure.

See what you have done to the ratio of the filter. Instead of 2.5:1 it is now 3.4:1. This could very easily cause the filter to blind in a very short time.

The blast gate is used to induce artificial resistance into the system until the permanent dust loading is on the bags. It will also take care of errors in calculating the resistance in the piping system, hoods, etc. The correct procedure at startup would then be this:

At startup, the gate is closed. The fan started. With the use of a Pitot tube and manometer, measure the air volume as the blast gate is gradually opened. Continue to open the blast gate until the design volume is coming through the dust filter. As the dust is deposited on the cloth, the pressure drop, just before cleaning, will gradually rise until it reaches a leveling off point. This is the operating pressure drop across the filter.

RECOMMENDED RATIOS OF AIR TO CLOTH (continued)

LIMESTONE: Use a ratio of 2.75:1 and a branch pipe velocity of 4500 fpm.

LEAD OXIDE: Use a ratio of 2.25:1 and a branch pipe velocity of 4500 fpm.

LIME: Use a ratio of 2:1 and a branch pipe velocity of 4000 fpm.

MANGANESE: Use a ratio of 2.25:1 and a branch pipe velocity of 5000 fpm.

MARBLE: Use a ratio of 3:1 and a branch pipe velocity of 4500 fpm.

MICA: Use a ratio of 2.25:1 and a branch pipe velocity of 4000 fpm.

OYSTER SHELL: Use a ratio of 3:1 and a branch pipe velocity of 4500 fpm.

PAINT PIGMENTS: Use a maximum ratio of 2:1 and a branch pipe velocity of 4000 fpm.

PAPER: Use a ratio of 3.5:1 and a branch pipe velocity of 3500 fpm. Special hopper discharge valves are recommended.

PLASTICS: Use a ratio of 2.5:1 and a branch pipe velocity of 4500 fpm. Explosion relief provisions are usually required.

QUARTZ: Use a ratio of 2.75:1 and a branch pipe velocity of 4500 fpm.

ROCK: Use a ratio of 3.25:1 and a branch pipe velocity of 4500 fpm.

To reach this leveling off point usually requires from two to five days of filter operation. In nearly all cases it will be less than the design pressure drop.

As this pressure drop rises the blast gate should be opened, and measurements taken to keep the air volume at design values. This does not have to be done on a constantly controlled basis. The gate can be opened a very small amount each day until the filter has leveled off. Seems like a lot of trouble. Believe me it is not nearly the trouble of replacing a set of bags after only a few weeks of operation.

Once the pressure drop across the dust filter has leveled off, a final adjustment to the gate with the correct volume is all that is necessary. There is no reason for further adjustment of the gate, until a new set of bags are installed. Then this same procedure should be followed.

With the blast gate adjusted, you are then free to juggle air volumes at the branches and hoods without fear of overloading the dust filter or exceeding the design ratio.

After the filter has operated for a few hours, shut it down and check it for leaks. There should not be any dust in the clean air side. If there is, find out where the leaks are and fix them at once. Leaks can be caused by careless assembly of case joints, etc. There may also be a hole accidently punched in a new bag. In any case, take care of it at once.

Once the filter is in operation, it should not be forgotten. A regular inspection program can pay big dividends and head off a lot of troubles before they occur. If you know the signs, you can be warned of impending trouble. The following program to be carried out every two weeks to one month is suggested for carefree operation.

If Pressure Drop Is High . . .

Check the pressure drop across the dust filter. If it is higher than normal, it will indicate one or more of the following:

An increase of air volume being pulled through the dust filter

The beginning of blinding of the cloth

Hoppers that are full, closing off air flow to the bags

Possible condensation in the dust filter

Cleaning mechanism inoperative or broken

Operating procedures not being carried out by your operating personnel

A decrease in pressure drop can also indicate a number of things:

A drop in the air volume being pulled through the dust filter caused by:

Fan slowing down because of V-belts slipping

Dust on contacts of fan starter

Fan motor single-phasing

Broken bags

Plugged piping

Leaks in the clean air side of the dust filter case

Fan running backwards

Whatever the reason for the increase or decrease of pressure drop, find it, and correct it as soon as possible. The longer you let it go, the worse it will become, and it can cause other troubles.

Check the air volume being handled by the fan, don't guess.

Check the fan rotation and speed.

Check the V-belt drive for tension and wear.

Check the clean air side of the filter for leaks, broken bags, etc.

Check bags for blinding, crusting, or evidence of condensation.

Check hoppers to see that they are being emptied.

Check cleaning mechanism and its adjustment.

Check dust piping for evidence of filling.

Check dampers and blast gates to see that they are in the correct position.

Check hoods to see that they have not been changed, taken off, or destroyed.

Check operating personnel to see that correct procedures are being followed.

Keep a log of each dust filter so that any change in operation is apparent. Don't trust your memory.

The time to take care of trouble is now, not later. If caught soon enough and taken care of, only a few hours of downtime may be required. Put it off a few days or weeks, and your downtime may be days or even weeks.

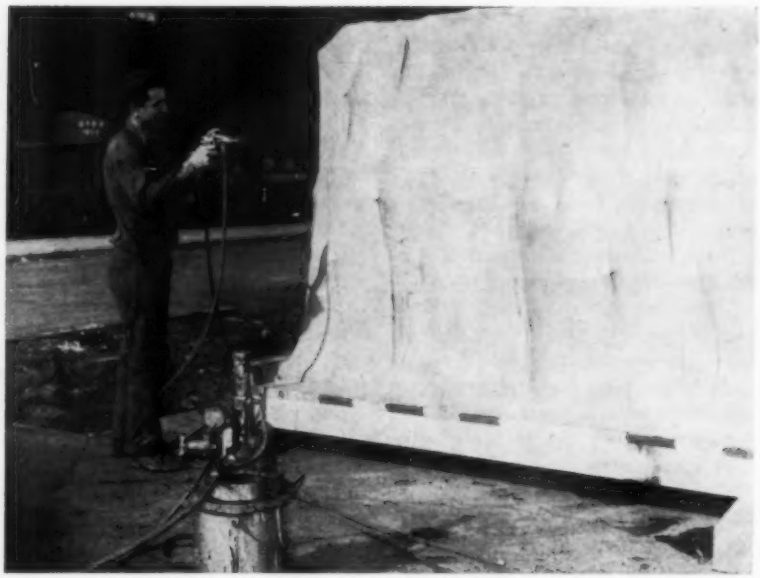
Treat your dust filter as you would any other piece of equipment in your plant. With normal care of selection, installation, operation, and maintenance, your dust filter will provide you with dependable, trouble-free service, and pay you dividends over the years. **End**

SANDERS:	**Use a ratio of 3.25:1 and a branch pipe velocity of 4500 fpm. Flame-retardant cloth and a preliminary spark arrester section is recommended.**
SILICA:	**Use a ratio of 2.75:1 and a branch pipe velocity of 4500 fpm.**
SLATE:	**Use a ratio of 2.75:1 and a branch pipe velocity of 4500 fpm.**
SOAP:	**Use a ratio of 2.25:1 and a branch pipe velocity of 3500 fpm. Flame-retardant bags and pressure relief provisions are recommended.**
STARCH:	**Use a ratio of 2.25:1 and a branch pipe velocity of 3500 fpm. Flame-retardant bags and pressure relief provisions are recommended.**
SUGAR:	**Use a ratio of 2.25:1 and a branch pipe velocity of 4000 fpm. Pressure relief provisions are recommended.**
SOAPSTONE:	**Use a ratio of 2.25:1 and a branch pipe velocity of 4000 fpm.**
TALC:	**Use a ratio of 2.25:1 and a branch pipe velocity of 4000 fpm.**
TOBACCO:	**Use a ratio of 3.5:1 and a branch pipe velocity of 3500 fpm. Pressure relief provisions, flame-retardant cloth and special hoppers and valves are recommended.**
WOOD:	**Use a ratio of 3.5:1 and a branch pipe velocity of 3500 fpm. Special hoppers, valves, and pressure relief provisions are recommended.**

More Plant Floor Space Made Available Because . . .

EQUIPMENT GETS TOUGH HIDE FOR OUTDOOR STORAGE

By **P. A. BOELLNER**
Engineering Associate
Western Electric Company, Inc.



Protective coating is being applied to this large piece of machinery, using portable pumping and spraying equipment.

AT THE Baltimore Works we have recently adopted modern weatherproofing techniques to help solve our machinery and equipment storage problems. The process selected utilizes spray coating of plastic materials over the equipment contour, or over cheesecloth and tape, depending on the nature of the equipment.

Items which could be critically affected by rust or corrosion if not adequately protected, are seeded with silica gel packets and moisture indicating cards are inserted for control. The protected items are then placed in outside storage areas, releasing plant floor space for other uses.

Preliminary preparation of equipment to be protected will vary, depending upon the nature, size and shape of each item and the anticipated length of time it is to remain stored outdoors. These factors should be used to justify the selection of correct combinations of available protective products. Such combinations could include a water repellent with a minute protective film, cheesecloth, corrosion inhibitor paper, waterproof tape, desiccant and control cards or sprayed peelable plastic.

Palletizing, skidding, or boxing of equipment is not always essential if the selected storage area is paved. Large units should be skidded on huge timbers as if they are to be shipped. Although solid floor pallets are more desirable, pallets with separate deck boards can be used for smaller machine units, motors, and large tools. Anything which is mobile in itself, such as core trucks, does not need skidding or palletizing. Small items are packed in non-returnable wooden boxes or steel drums.

The tops of pallets and skids are coated with weatherproof plastic before equipment to be stored is placed upon them. By adjustment of the spray gun nozzle and controlling the air pressure for a light fine spray, the fast-drying liquid plastic forms into a stringy coating resembling a cobweb. This will span any void up to approximately 8 in. Within a few minutes this webbing becomes sufficiently dry to permit a solid coating to be applied over it which is obtained by readjustment of the spray nozzle and air flow for a heavier spray.

After 30 minutes the object can be carefully placed on the pallet or skid and similarly coated over the entire exterior. Special care should be taken to see that an airtight bond is accomplished at the base of the unit and the top of the pallet which was previously coated. Voids over 8 in. in width can be narrowed by the use of tape, cheesecloth, or corrosion-proof paper.

Long-term storage would dictate the use of the water repellent, desiccant, control cards and covering with cheesecloth over which the peelable plastic is sprayed. Wide mesh cheesecloth is loosely draped over the equipment.

The edges are taped together or bonded by a small jet flow of the plastic from the spray gun at the point of overlap of the strips of cheesecloth. One pass of webbing and two of heavy spray with a few minutes of drying time between each pass will produce a "hide" which is impenetrable after 48 hours except to a knife or any other sharp instrument.

Many of the items have been

stored outdoors for over a year. Inspections to date have shown no damage from exposure to weather or from the process itself. Since the coating is peelable, there is little work involved in returning these stored items to service. Records are kept of equipment which has been treated in this manner and a listing is circulated periodically to interested organizations within the company to avoid purchasing equipment which is available in storage and to eliminate retention of items no longer needed.

We are using two types of coating material. One type is best for contour coating and is applied in two coats 2 to 3 mils thick using a standard spray gun, and offers protection for about three years. The other type of material is basically similar but permits better webbing over void areas and is somewhat thicker when dry. Under normal conditions, the drying time of either of the materials used is approximately 30 minutes. A tensile strength of 1500 psi is developed after drying for 48 hours. Similar processes are widely used in industry and a variety of materials are marketed for this purpose.

In addition to floor space savings, we have benefited from improved housekeeping, increased security and control, and easier handling of stored equipment. To date 9000 sq ft of plant space formerly occupied by machinery and equipment storage has been released at the Baltimore Works. Use of an additional estimated 5000 sq ft has been avoided by direct outside storage for a total space savings of 14,000 sq ft. This equipment is contained in a corresponding 10,000 sq ft area outside the plant.

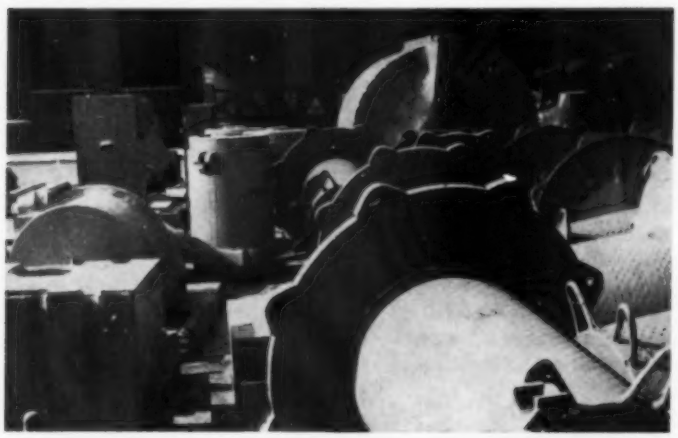
Excluding equipment and facilities costs, the labor and material charges have mounted to about $12,000 or $0.857 a square foot. Representative costs for treating and applying the peelable protective membrane over selected items are: Core truck—$17 each, Strander—$600, Extruder, with cabinet and controls—$250, Non-Returnable box of reels or parts—$12 each.

Our experience with this program indicates its greatest value occurs on inception. Through the stimulation of the program and with a little judgement, a large portion of equipment which has accumulated in any plant storage area can be consigned to the scrap car at the outset. Remaining items are removed physically and the results are impressive.

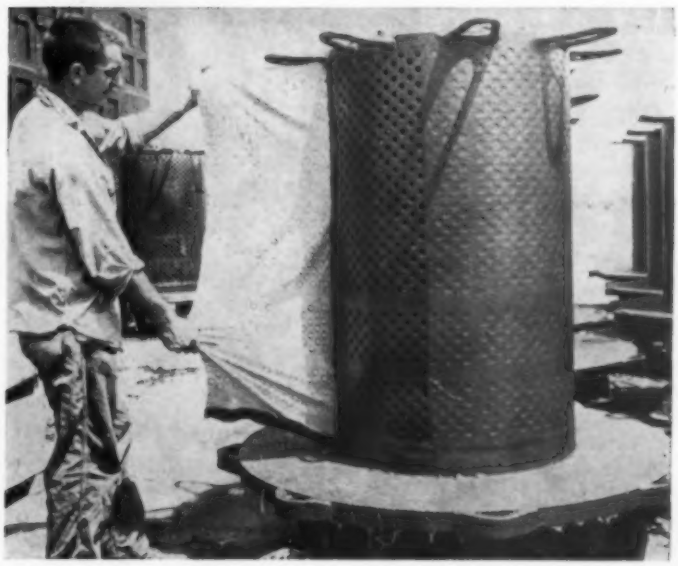
At present our announced ground rules are these:

1. There are no assigned machinery storage areas as such; functional organizations are required to provide for temporary placement of incoming, moved, temporary surplus equipment in the shop areas in which they will be used, or until disposed of.
2. Equipment which must be kept for a longer period may be encapsulated and stored outdoors providing the expense involved can be justified.
3. Unless the space is immediately required for a productive installation, action is deferred.

In spite of readily recognized limitations, we feel the encapsulating procedure as outlined frequently offers the best solution to problems of space and storage. Local conditions, of course, will greatly affect the feasibility of such operations. **End**



After receiving coating, equipment is placed in an outdoor storage area, releasing valuable plant floor space.



If the item has to be returned to service, the protective coating can be peeled off in a matter of minutes.

A B C's of BOILER WATER TREATMENT SPELLED OUT IN Q's and A's

By **B. J. WACHTER**, Staff Engineer, Industrial Division
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Questions may arise, from time to time, in the ranks of plant engineering personnel why certain water treatment methods are prescribed and what they do.

Here are some answers that should be of help in removing any confusion which may exist. The information not only deals with types of treatment, but kinds of problems that you may encounter, and other details.

1. What Problems Do Deposits Cause?

The biggest problems that deposits cause are overheating and failure of boiler tubes. A deposit acts as an insulator and excessive deposits prevent an efficient transfer of heat through the tubes to the circulating water. This causes the metal itself to be overheated. When the overheating is severe enough and long enough, the metal fails. Boiler deposits can also cause plugging or partial obstruction of circulating tubes.

Another important danger of boiler deposits is that corrosive attack may occur underneath the deposits. In general, boiler deposits can cut operating efficiency, produce boiler damage, cause unscheduled boiler outages, and increase cleaning expense.

2. What Is Corrosion Fatigue?

This type of cracking in boiler metal may occur by two different mechanisms. In the first mechanism, cyclic stresses such as are created by rapid heating and cooling are concentrated at points where corrosion has roughened or pitted the metal surface. This is usually associated with improper corrosion prevention.

The second type of corrosion-fatigue cracking occurs in boilers with properly treated water. In these cases corrosion fatigue is probably a misnomer. These cracks often originate where the metal surfaces are covered by a dense protective oxide film and cracking occurs from the action of applied cyclic stresses. Corrosion fatigue cracks are usually thick, blunt and across the metal grains. They usually start at internal tube surfaces and are most often circumferential on the tube.

3. What Is Caustic Cracking?

Caustic cracking (caustic embrittlement) is a serious type of boiler metal failure characterized by continuous, mostly intergranular cracks. The following conditions appear to be necessary for this type of cracking to occur: 1. the metal must be stressed; 2. the boiler water must contain caustic; 3. at least a trace of silica must be present in the boiler water; 4. some mechanisms such as a slight leak, must be present to allow the boiler water to concentrate on the stressed metal.

Caustic cracking is a particular problem in older boilers with riveted drums because of stresses and crevices in the areas of rivets and seams. While this type of cracking has become less frequent since the advent of welded drum boilers, rolled tube ends are still vulnerable areas of attack. The possibility of caustic cracking should be considered in any water treatment program.

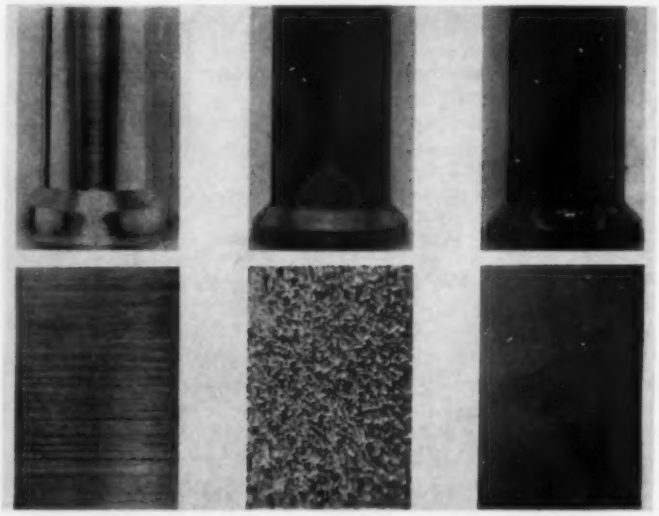


Fig. 1. Shown at right is the result of organic treatment to prevent magnetic iron oxide deposits like those in the lower center sample.

4. What Measures Can Be Taken to Prevent Boiler System Corrosion?

The most common measures for prevention of corrosion include: 1. removing dissolved oxygen from the feedwater; 2. reducing the amount of free carbon dioxide in the boiler system; 3. maintaining of alkaline conditions in the boiler water; 4. keeping internal surfaces clean; 5. protecting boilers during out-of-service intervals; 6. counteracting corrosive gases in steam and condensate systems with chemical treatment.

The selection and control of chemicals for preventing corrosion require a thorough understanding of the causes and corrective measures.

5. What Is Boiler Water Carryover?

Boiler water carryover is the contamination of steam with boiler water solids. There are four common types of carryover.

In one, bubbles or froth actually build up on the surface of the boiler water and pass out with the steam. This is called foaming.

In the second type, small droplets of water in the form of spray or mist are thrown up into the steam space by the bursting of the rising steam bubbles at the release surface. This is sometimes called "aquaglobejection."

In the third type there is a sudden surge of boiler water that carries over with the steam. This is called priming.

Steam contamination may also occur from leakage of water through improperly designed or installed steam separating equipment in a boiler drum.

6. What Measures Can Be Taken To Prevent Carryover?

The most common measure is to maintain the concentration of solids in the boiler water at reasonably low levels. Avoiding high water levels, excessive boiler loads, and sudden load changes also help.

Very often contaminated condensate returned to the boiler system causes carryover problems. The condensate should be temporarily wasted until the source of contamination is found and eliminated. The use of chemical antifoam agents can be very effective in preventing carryover due to high concentrations of impurities in the boiler water.

7. What Is Clarification?

Clarification is the removal of suspended matter and/or color from water supplies. The suspended matter may consist of large particles which settle out readily. Clarification equipment merely involves the use of settling basins and/or filters. Most often, however, suspended matter in water consists of particles so small that they do not settle out and even pass through filters. The removal of these finely divided or colloidal substances therefore requires the use of coagulants.

8. What Is Chemical Precipitation?

In precipitation process the chemicals added react with dissolved minerals in the water to produce a relatively insoluble reaction product. Precipitation methods are used in reducing dissolved hardness, alkalinity, and in some cases silica. The most common example of chemical precipitation in water treatment is lime-soda softening.

9. What Are the Various Methods of Lime-Soda Softening?

The two general types are intermittent (batch type) and continuous. The older method of intermittent softening consists of mixing the chemicals with the water in a tank. Time is allowed for reaction, sludge settlement and clear water outflow.

The more modern method of continuous lime-soda softening involves the use of specially compartmented tanks. Provisions are made for: 1. proportioning chemicals continuously to the incoming water; 2. retention time for chemical reactions and settling of sludge; and 3. continuous draw-off of softened water.

Lime-soda softening may also be classified as hot or cold, depending on the temperature of the water. Hot process softeners increase the rate of chemical reactions and give better quality water.

10. What Are the Disadvantages of Lime-Soda Softening?

The main disadvantage is that while hardness is reduced it is not completely removed. Wide variations in raw water composition and flow rate also make control of this method difficult since it involves adjusting the amount of lime and soda ash being fed.

11. What Are the Advantages of Lime-Soda Softening?

The main advantage is that in reducing hardness, alkalinity and silica can also be reduced. In addition, prior clarification of the water is not usually necessary since suspended matter and turbidity are also removed in the process. Another advantage is that with continuous hot process softening some removal of oxygen and carbon dioxide can be achieved.

12. What Is Ion Exchange?

When minerals dissolve in water they form electrically charged particles called ions. Calcium carbonate, for example, forms a calcium ion with plus charges (a cation) and a carbonate ion with negative charges (an anion).

Certain natural synthetic materials have the ability to remove mineral ions from water in exchange for others. For example, in passing water

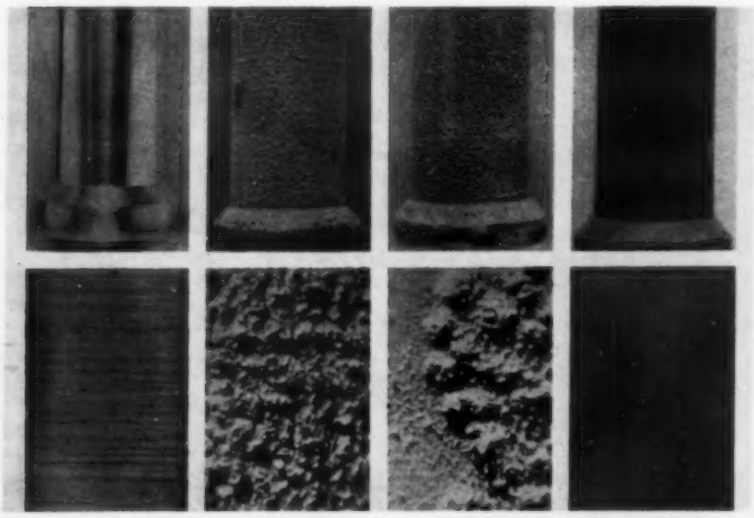


Fig. 2. Magnifications along lower row show calcium phosphate and magnesium phosphate deposits. Marked result of organic treatment is at right.

through a simple cation exchange softener all of the calcium and magnesium ions are removed and replaced with sodium ions. Ion exchange materials usually are provided in the form of small beads or crystals which compose a bed several feet deep through which the water is passed.

13. What Is Demineralization?

Demineralization involves the passing of water through both cation and anion exchange materials. The cation exchange process is operated on the hydrogen cycle. That is, hydrogen is substituted for all of the cations. The anion exchanger operates on the hydroxide cycle which replaces hydroxide for all of the anions. The final effluent from this process consists essentially of hydrogen ions and hydroxide ions, or water.

The demineralization process may take any of several forms. In the mixed-bed process the anion and cation exchange materials are intimately mixed in one unit. Multibed arrangements may consist of various combinations of cation exchange beds, weak and strong based anion exchange beds and degasifiers.

14. What Are the Disadvantages of Ion Exchange?

The main disadvantage with sodium cycle ion exchange softening is that the total solids, alkalinity and silica contents of the raw water are not reduced. A problem encountered with cation exchange on the hydrogen cycle is corrosion from acidity of the effluent. With demineralization the chief difficulties are cost—particularly on high solids raw waters, and the corrosive nature of the effluent water.

In general, fouling of the ion exchange material with suspended or colloidal matter in the raw water can produce difficulties and some water impurities cause degradation of the material. In many cases, therefore, ion exchange processes require pretreatment of the water supply.

15. What Are the Advantages of Ion Exchange?

The main advantage of zeolite softening is ease of control. Ordinary variations of hardness in the raw water or in flow rate do not affect completeness of softening. Also the system generally takes up less space than the lime-soda system and in most cases gives a softer water. The use of acid exchangers has advantages when a low alkalinity soft water is required.

The main advantage of ion exchange demineralization is its ability to produce better quality water than can be obtained by any other method.

16. What Is the Purpose of Deaeration?

Since dissolved oxygen in water is a big factor in corrosion of boiler systems, it is desirable that it be removed before the water is put into a boiler. Feedwater deaeration is accomplished by intimately mixing the water and steam in a deaerating heater. Part of the steam is vented, carrying with it the bulk of the dissolved, oxygen from the feedwater.

There are two basic types of steam deaerators: the spray type and the tray type. In the spray deaerator a jet of steam mixes intimately with the feedwater being sprayed into the unit.

In the tray type the incoming water is allowed to fall over a series of trays causing the water to be broken up into small droplets to permit intimate contact with incoming steam.

17. What Difficulties Are Encountered in Internal Treatment?

The main difficulty is the presence of a large amount of sludge formed when feedwater hardness is high. This may increase the amount of blowdown required. When internal treatment is used alone (without pretreatment of water by external means) there is more possibilty for scale in the preboiler system and feedwater lines. It is important that someone experienced in the technology helps to set up an internal treatment program which will minimize these difficulties.

18. What Are the Advantages of Internal Treatment?

The prime advantage is that in many instances internal treatment can eliminate the need for extensive external treatment equipment. In addition, the simplicity of an internal treatment program offers a decided savings in manpower for feeding and control.

19. What Units Are Used in Expressing Water Analysis Results?

The most common unit is parts per million (ppm). One ppm of a substance in a water sample represents one unit weight of the substance in each million unit weights of the water. For example, one ppm of salt (NaCl) means one pound of salt per million pounds of water.

Another older (but still frequently used) unit is grains per gallon (gpg). This unit represents a definite weight; one grain is equal to 1/7000 of a pound. Since a gallon of water weighs 58,349 grains, one gpg of salt represents one part of salt for every 58,349 parts of water. (One gpg equals 17.1 ppm.)

Analyses are sometimes expressed

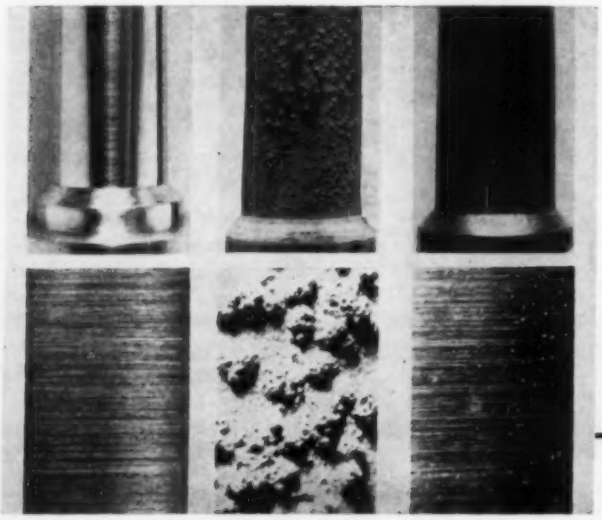


Fig. 3. Center illustrations show the calcium carbonate deposits formed on a boiler tube at 250 psi.

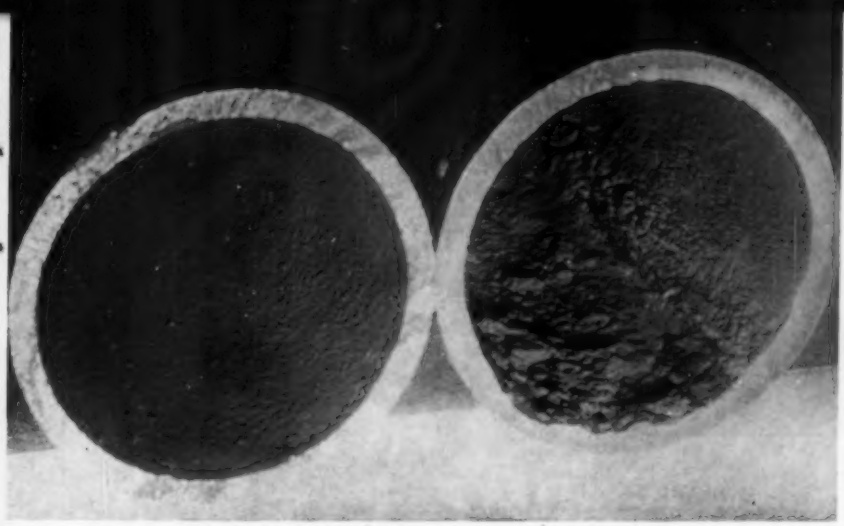


Fig. 4. Section from steam condensate line provides proof of deposits forming in untreated pipe after five years' service. An inhibitor was used in line from which section at left was taken. Note the surface condition.

in equivalents per million (epm). Parts per million (ppm) divided by the equivalent weight of the substance is equal to epm. (Equivalent weight is molecular weight divided by valence.)

20. Why Are Some Analysis Results Expressed "As $CaCO_3$"?

Water treatment reactions are based on the combining weights of the reacting substances. For example, 106 lb of soda ash (molecular weight 106) reacts with 136 lb of calcium sulfate (molecular weight 136).

The molecular weight of calcium carbonate ($CaCO_3$) is the round number 100. In order to simplify chemical dosage calculations all hardness and alkalinity results are usually based on the molecular weight of calcium carbonate and the expression "as $CaCO_3$" is used. For example, according to this system, one ppm of soda ash (expressed as $CaCO_3$) will react with one ppm of calcium sulfate (expressed as $CaCO_3$). This is the same as converting English pounds, German marks, or French francs into a 100 cent dollar.

21. How Much Blowdown Is Needed?

Blowdown requirements depend on the concentrations of the various feedwater impurities a given boiler can tolerate; the more concentrations possible the less blowdown needed. For example, with 10 feedwater concentrations in a boiler, blowdown equal to 10 per cent of the feedwater flow rate is needed; with 20 concentrations only 5 per cent blowdown is needed.

To illustrate how blowdown requirements are calculated let us assume that the maximum amount of suspended solids (sludge) in the boiler water that a particular boiler can tolerate is 500 ppm. If the feedwater contains 50 ppm of hardness it can be concentrated only about 10 times (since feedwater hardness is precipitated as suspended solids in the boiler water). This means that for every 100 lb of water fed into the boiler about 10 lb of boiler water must be blown down to keep the suspended solids from exceeding 500 ppm.

22. How Is Steam Condensate Corrosion Prevented?

The general approach may involve removing oxygen from the feedwater mechanically and chemically, and providing pretreatment of the makeup water to minimize potential carbon dioxide formation in the boiler. Additional chemical treatment may consist of using volatile amines to neutralize carbon dioxide and/or a volatile filming inhibitor to form a barrier between the metal and the corrosive condensate. Mechanical conditions such as poor trapping and draining of lines, and air in-leakage may need to be corrected.

23. What Are the Methods of Preventing Caustic Embrittlement?

Practical experience has shown that certain organic materials such as lignins and tannins applied to the boiler water are effective in preventing caustic cracking of boiler steel. Sodium nitrate has also proven to be a good inhibitor at relatively low concentrations ranging up to 0.4 parts of sodium nitrate per part of caustic soda in the boiler water. A program for prevention commonly used consists of maintaining a boiler water organic content of 80-100 ppm and a sodium nitrate content of 50 ppm.

Another method that has been used is the "coordinated phosphate-pH" method in which all of the boiler alkalinity is theoretically maintained in the form of tri-sodium phosphate, rather than as caustic soda. This method is applicable only when relatively pure feedwater is available.

An earlier method consisted of maintaining certain ratios of sodium sulfate to total alkalinity in the boiler water. While this method appeared to be effective in some cases, it has been largely replaced by the use of nitrates and organics.

24. What Problems Does Oil in Boiler Water Cause?

Oil contamination of boiler water is harmful from three standpoints: 1. oil can coat metal surfaces, cut down heat transfer and produce metal overheating; 2. oil can sludge to become sticky and adhere to heat transfer surfaces; 3. oil can produce foaming and boiler water carryover.

Whenever possible oil contamination should be completely eliminated. Some organic treatment chemicals will help counteract the effects of small amounts of oil contamination but not of gross contamination. Boiler waters containing large amounts of suspended solids usually can tolerate somewhat more oil without trouble because oil is absorbed by the suspended solids.

25. What Is the Wet Method of Boiler Layup?

It is a method of storing boilers full of water so that they can be readily returned to service. It involves adding extra chemicals (usually caustic, organics, and sodium sulfite). The water level is raised in the idle boiler to eliminate air spaces and the boiler is kept completely full of treated water. Special considerations go into protecting superheaters.

26. What Is the Dry Method of Boiler Layup?

This method of layup is usually for longer boiler outages. It involves draining, cleaning and drying out the boiler. A material which absorbs moisture such as hydrated lime or silica gel is placed in trays inside the boiler. The boiler is then sealed carefully to prevent in-leakage of air. Periodic inspection and replacement of the drying chemical is required during long storage periods. **End**

Fig. 1. Bus duct, mounted on column web, connects to plug on main bus.

Bus Duct Serves as Panelboard, CUTS POWER DISTRIBUTION COSTS

By **C. R. WHEELER**, Plant Engineer
The Monarch Machine Tool Company, Sidney, Ohio

POWER IS DISTRIBUTED throughout our plant area by means of a system of bus ducts mounted high in the air to provide clearance for overhead cranes. Power is fed down the building columns from either bus-mounted fusible switches or circuit breakers to feed the machine tools.

A power panelboard is usually required at the base of the column to provide short circuit protection and switching for up to six machines. We have experienced considerable damage to these power panelboards, because they are quite large and project beyond the column. In addition, we have found them to be an expensive means of providing electrical protection.

A new 100-amp bus duct, recently introduced by Westinghouse Electric Corporation, solved many of the problems we have encountered in protecting power panels. A standard 10-ft section of bus duct mounted tight to the column web, is used as a power drop. The duct will take five, 15- to 100-amp breakers on one side. Breaker ratings will handle up to a 50-hp motor at 440 v, or a 25-hp motor at 220 v. Installation consists of plugging the proper breaker into the bus duct section.

A cable tap box is used at the top of the bus duct section to permit a regular conduit connection between the drop and the main power bus duct. A small screw block fitting is available to connect wire ends directly to the round aluminum bus bars.

Breakers are mounted in the drop and are protected by the flanges of the 12-in. by 14-in. H-column. Load sides of the breakers are connected to floor machinery through suitable conduit and wire.

The bus duct section makes a very simple, easily installed power drop. It is economical, compared to a panelboard, and as the entire installation is within the confines of the column flanges, is adequately protected against damage. **End**

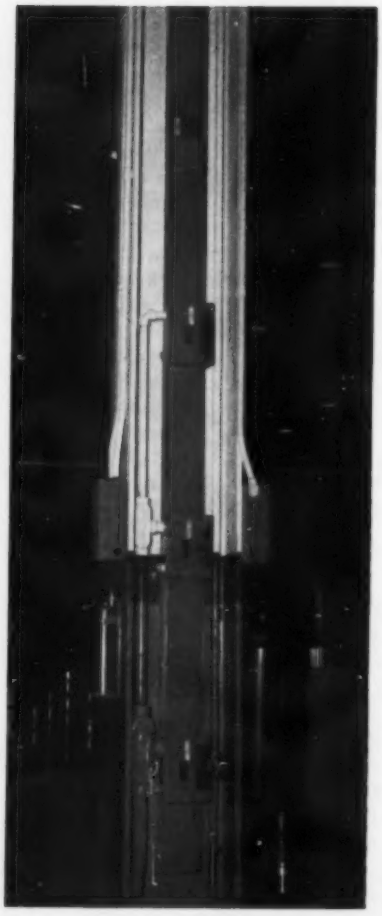


Fig. 2. Circuit breaker plugs tap duct to feed machines near column.

CENTRAL CUTTING OIL SYSTEM ELIMINATES BUCKET MIXING

By **Kenneth F. Biddle**, Plant Engineer
Sundstrand Aviation, Rockford, Ill.

A REMEDY was needed to eliminate the problems of supplying acceptable water soluble cutting oils to our machines. The oil-water ratios varied considerably from machine to machine, the man-hours needed each day to service these machines were high and general housekeeping conditions were poor.

This is the way we were doing it. When coolant was to be changed a mobile tank was used, and the sump was pumped out and cleaned. Next the serviceman filled the sump with water, then added what he believed to be the required amount of soluble oil. The mixing was accomplished by

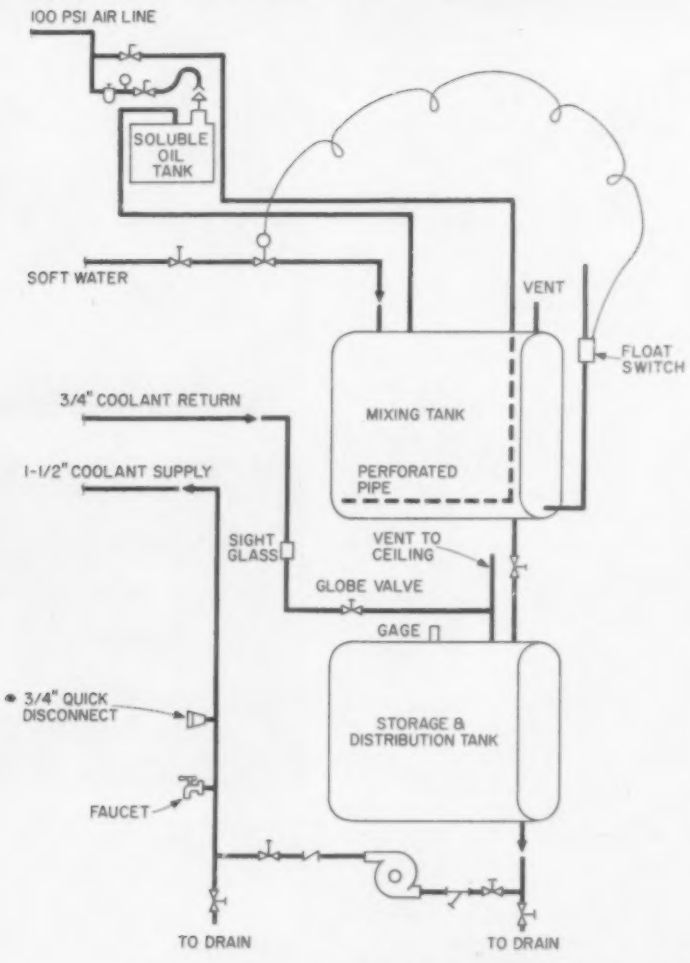


Fig. 1. Diagram shows newly installed soluble oil mixing system which has reduced the serviceman's time in filling sumps, improved cutting oil quality and housekeeping.

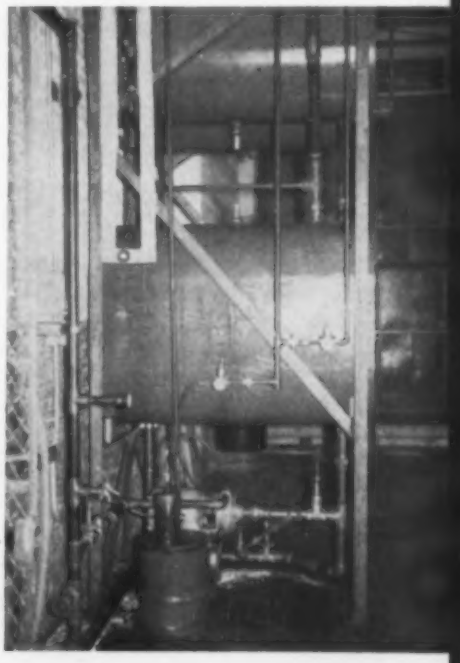


Fig. 2. Tank installation: mixing tanks, top; storage tanks, center; soluble oil container, system pump, bottom.

Fig. 3. Air line into soluble oil container pressures oil into mixing tank. Pump circulates the cutting oil.

Fig. 4. Typical supply drop has quick connect coupling for machine hose; faucet is used to fill makeup pail.

Fig. 5. Sump pump machine, equipped with hose and reel, simplifies job of cleaning and filling machine sumps.

CENTRAL CUTTING OIL SYSTEM

circulating the water and oil solution through the machine by its own pump.

Between changes the necessary coolant makeup was the responsibility of the machine operator. He would go to the nearest 55-gal drum, several of which are spotted throughout the shop, and hand-dip a bucket of coolant and carry it to his machine.

Obviously, there were a number of disadvantages to this routine. First, the resultant oil-water ratios depended on the accumulative judgement of several men; the man cleaning the sump, the man who daily refilled the many 55-gal "makeup" coolant drums and the operator.

The machine sump capacities varied as widely as the drum refill requirements which helped make the job of estimating the per cent of additional oil very difficult. Also, this solution was poorly mixed and bucket dispersal added another variable to the mixture ratio.

The direct expense factor was the four to six man-hours spent daily to visit and fill these drums. Dipping a bucket in the drum was messy, and the floors were soon the same way. As the drum contents ran low and the operators found it increasingly difficult to lean into the oily drum for coolant, they often just added water, which again altered the oil-to-water ratio.

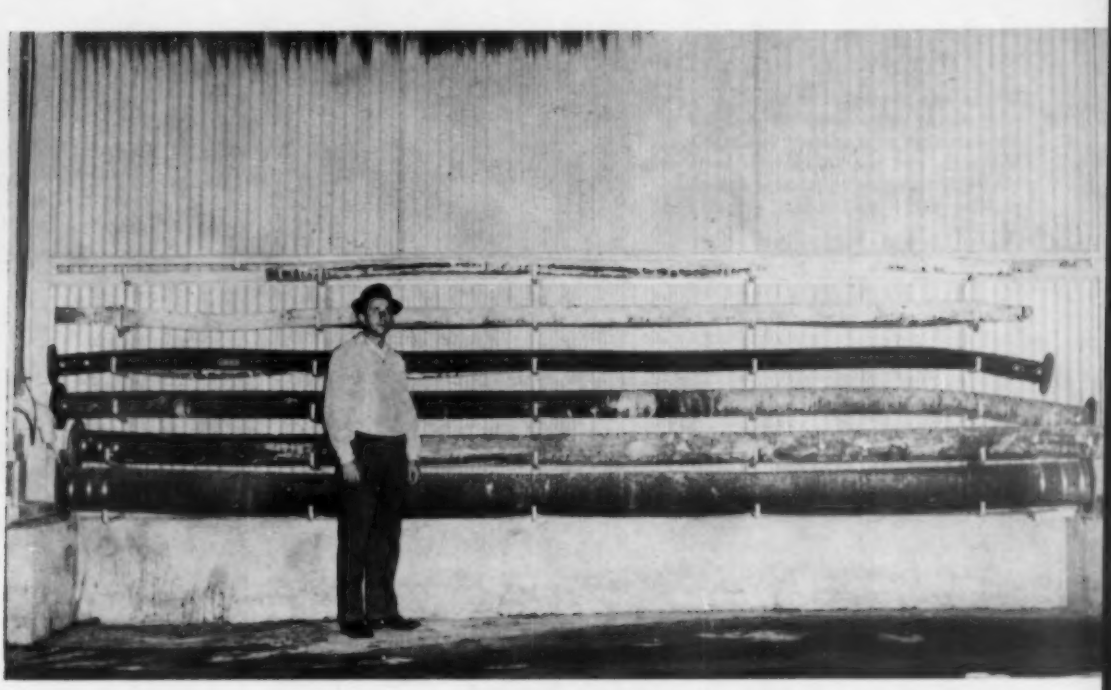
We use about 500 gallons of coolant mix daily in two oil-water mixture ratios. Thus in our new system four 275-gal oil tanks, two for each mixture, are used as the mixing and storing vehicles. Figure 2 shows this entire tank installation. To charge the system, the mixing tank is half filled with water, then the measured quantity of soluble oil is added followed by the final water charge. Mixing is accomplished by air agitation as shown in Fig. 1.

When mixing is complete, the storage tank is filled by gravity flow as needed. A new batch can be started once the mixing tank is empty. Distribution is through 1½-in. pipe with continuous pumping in a closed loop with a ¾-in. return line. The two service loops are 712 ft and 1022 ft in length and have a total of 32 service drops. Service drops are ¾ in. and located at strategic points in the shop. Figure 4 shows a closeup of a typical drop, with the quick disconnect hose attachment used in the filling operation and the faucet for the operator's use in makeup.

In the new procedure, machines are pumped out and cleaned as before, but now properly mixed coolant is added to the machine sump from a hose connected to the distribution piping drop. When an operator requires makeup, he draws a bucket of coolant from a spigot on the distribution drop.

This system improved housekeeping, eliminated the four to six man-hours required for filling drums, and provided greatly improved control of our cutting oil.

With six months' experience, we estimate that our $4358 project will return labor savings at $2500 annually. Operating cost reductions in coolant consumed, machine downtime and improvement in coolant quality are evident, but have not been evaluated. **End**



A location inside the main processing building has been set aside as a storage place for the various lengths and sizes of pre-cut hose sections. Reducers are near hose rack.

READY-MADE HOSE LENGTHS SPEED EMERGENCY PIPE REPAIRS

Process downtime cut to a minimum. Hose may also be used for temporary experimental flow circuits

By **DAN G. POPPE**, Plant Engineer
Uranium Reduction Co., Moab, Utah

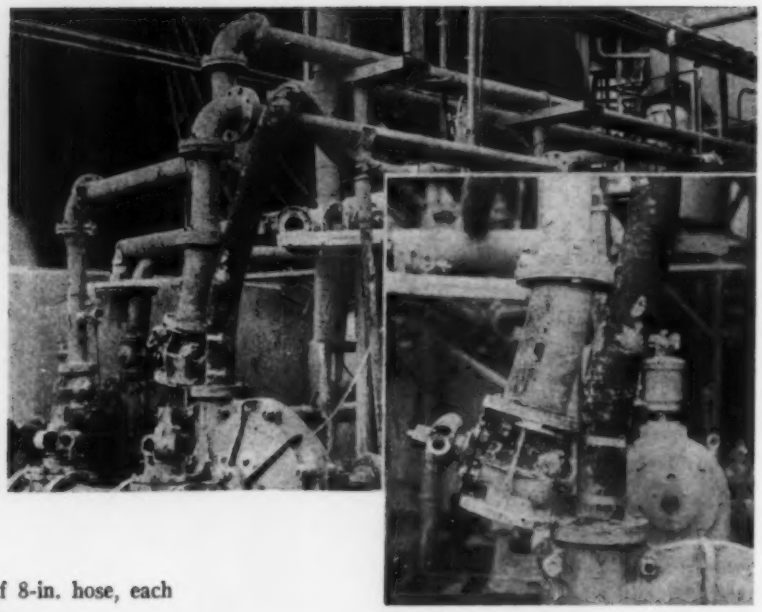
THE emergency use of hose as a substitute for piping is nothing new. In most cases, however, this measure is used as a last resort or as an afterthought. The pre-planned use of ready-made hose and flange assemblies can save many operational and maintenance dollars when fitted in with your corrective or preventive maintenance program.

Upon investigating maintenance piping installation and repair costs, it was discovered that the costs came from two areas; downtime resulting in production costs, and labor which increased maintenance costs. Eighteen per cent of all job orders involved pipework.

The greatest savings, it was learned, would come from reducing downtime. One approach to this problem would be to find some method of installing temporary piping quickly to keep the process operating with a minimum of downtime. In analyzing the reasons for high labor costs, it was found that when a piping job was planned and scheduled properly, the costs were reasonable.

Pipe repair jobs on operating circuits are usually unplanned and unscheduled because most repairs must be completed quickly in order to reduce downtime. The solution to the problem of downtime and labor costs would be a method of 1. installing temporary piping rapidly and 2. allowing sufficient time to plan and schedule a permanent pipe job.

Lengths of ready-made hose easily available, appeared to be the best solution to the problem of making pipe changes quickly and allowing time to make permanent repairs. To accomplish this, a survey was made of the various sizes of pipe subject to failure due to corrosion or abrasion and a few lengths of each size hose were made up. This consisted of two lengths of 2-in. hose, two lengths of 4-in. hose, one length of 5-in. hose, one



These two photos of an actual temporary piping repair show the permanent but damaged pipe section swung out of the way and the temporary hose in place. Later, the pipe was removed, repairs made, and it was reinstalled.

EMERGENCY PIPE REPAIRS

length of 6-in. hose and one length of 8-in. hose, each hose being 20 ft in length.

The variety of sizes was held to a minimum by having reducers on hand to make the ready-made hose more versatile. A cool area was selected inside the main process building and the hoses were stored on racks provided for this purpose. The reducers were stored adjacent to the hose rack for accessibility.

Here Are Two Examples

Two hypothetical piping jobs are presented for the purpose of demonstrating the value of having the temporary hose on hand and ready for use.

1. In the first case the temporary hose is not made up and perhaps not available: One night a 6-in. rubber-lined pipe, carrying a corrosive solution, ruptures. This pipe happens to be one the failure of which would hamper production. The nearest valve is closed, the operational supervisor is notified and a pipefitter is called out on overtime to make repairs.

The pipefitter arrives about 30 minutes later, gathers his tools and materials to make repairs. In removing the old pipe, the pipefitter discovers a damaged rubber lining and pipe near the flanged end and decides to cut that section and replace the corroded section. He welds the new section of original pipe and makes a temporary rubber lining repair so the operation may be resumed.

A conservative estimated time to do this job, from the time the pipefitter was called until operation was resumed, would be about 3 hours. This job must be repeated because only a temporary repair could be made.

2. In the second case the temporary hose is made up and on hand ready for use: One night a 6-in. rubber-lined pipe transferring a corrosive solution ruptures. The nearest valve is closed, the operational supervisor is notified and a pipefitter is called out on overtime to make repairs.

Pipefitter arrives about 30 minutes later, picks up a few wrenches only and inspects the damaged pipe for size and approximate length. He picks up a ready-made hose of the right size and, if necessary, reducers from the convenient hose rack. The damaged pipe is removed and the hose installed temporarily. The operation is resumed and a new section of pipe will be made at a later date and installed when convenient.

An estimated time to do this job from the time the pipefitter was called until operation was resumed would be about 1½ hours. The savings in production would of course depend on the circumstances, but at any rate they would be worthwhile. An even greater savings in time is possible if operators install the hose.

The above examples are not unusual. Of course, standby parallel piping should be installed in areas subject to very costly breakdowns, but the cost of this can be prohibitive and must be weighed against the chances of breakdown. The cost of ready-made hose assemblies that can be used as standby for many systems appears to be more economical than duplicating all or many systems with regular pipe.

Usual safety precautions should be observed when using hose as a substitute. Pressures, temperatures, and type of fluid involved must be considered. A job order should be issued after a temporary hose has been used as a substitute. The new piping should be installed on a properly planned and scheduled basis. The hose is then returned to rack, ready for future emergency use.

When setting up this system, all departments should be notified of the location and purpose of the ready-made hose. The advantages listed below may be included in a department letter of information that you may wish to send to the plant manager.

Keeps the operation on stream. The only interruption to production will be the length of time required to install the ready-made hose. Labor costs are reduced because the more time-consuming permanent repairs can be conveniently scheduled for operation and maintenance during regular working hours on a planned basis. The length of downtime is reduced.

If production should decide suddenly to experiment with a new flow circuit, it is more economical to first run a temporary hose until it has been decided that a permanent piping installation is desired. The temporary hose remains in place until the new piping has been installed and ready for final connection. The flow is turned off just long enough to make the final connections thereby allowing continued operation of the process with a minimum delay. **End**

TRAINING MAINTENANCE WELDORS

Part V — Qualification Testing Procedure

By **JOHN W. RANTALA** and **JACK ARZOOMANIAN**, Training Division
Maintenance Dept., Abbott Laboratories, North Chicago, Ill.

PROOF of any training program is the ability to qualify students for the work to be performed. In this last section of the series, we will set up procedures to qualify weldors, make known the detailed requirements of the qualification tests and create objectives for the welding operator to strive for in his practical training.

There are several factors that must be taken into consideration when setting up a qualification procedure. As an example, welding machines must be in good operating condition and of sufficient current capacity to handle the specified sizes and types of electrodes with ease. Any type of welding machine may be used.

A sturdy clamp type ground is desirable but any type of connection that provides a positive welding circuit ground may be used. The electrode cable should be of the highly flexible multi-strand type and the holder should be well insulated, but light enough to provide ease of manipulation.

It is permissible for the weldor to sit at a table of convenient height. Tables of 36 in. height and stools of 26 in. height are commonly used. Clamping facilities are needed to hold tacked plates at proper heights for position welding. Electrodes should not be laid on the working surface as they may become spark-burned or chipped. A conveniently located holder is desirable.

Straight oxyacetylene cuts and accurate angles of bevel are a must for preparation of joints in heavier metals. Hand-cutting, bevelling and grinding can produce excellent results. However, a motor-driven, rail-guided, oxyacetylene cutting machine will greatly facilitate preparation of these joints.

In the way of personal equipment it is important for the weldor to have a comfortably fitted helmet with his preferred shade of lens, protected by a clean cover glass. In addition, leather gloves and leather sleeves or jackets are needed for overhead welding. Safety goggles or glasses are a required item of personal equipment.

Hand tools available should include a well-sharpened slag hammer, having both a pick and chisel end; a narrow wire brush or facilities for machine-wire buffing for multi-pass welds; 4-in. C-clamps; ball-peen or cross-peen hammer; cold chisel; slip-joint pliers and a ruler.

Steel used for the qualification test must be very close in alloy content to that used for the actual construction. The materials to be used are specified in terms of ASTM (American Society of Testing Materials) or other code designations. The proper AWS electrode size and current must be specified. Welding positions must be clearly indicated with sketches or notes.

Detailed sketches must be used showing the type of joints to be welded, preparation of the edges, spacing, thickness of materials and other details of the joint. If backup strips or root welding from the back side is to be permitted, it should be stated and described. Welding polarity and range of current values should be specified.

Sketches and notes must be used showing the welding techniques to be used, number of passes or layers, diameter of electrode with the current for each layer or pass. In the case of vertical welding, it must be stated whether the welds are to be made vertical "up" or vertical "down".

If a "standard appearance weld" is used for one of the qualifying joints in the flat position, ¾ in. is the maximum thickness of metal that may be used. Two inches of the surface of each pass or layer must be showing and an acid etched cross section of each layer must be prepared.

Tools and equipment must be provided for chipping, grinding, or flame gouging of cracks or blow holes that might appear on the surface of beads. Defects must be removed before depositing additional layers of weld metal. If peening is to be used, it must be specified and a description given of the degree of peening to be done.

Some metals require preheating prior to welding and others require maintaining a certain temperature during welding. Many metals require stress-relieving after welding. If any of these heat treatment operations are to be performed, the temperature should be indicated for each operation.

Two basic types of welds are made in various thicknesses and positions; these are fillet welds and groove welds. Some of the joints welded in these tests are not representative of the types welded on the job, but they are designed to lend themselves to destructive testing. The degree of skill required to weld them is a good measure of the weldor's ability.

Tests used must determine tensile strength, shear strength, ductility and the degree of soundness of the welds. However, every weld is not tested for all the above physical properties. High quality, acceptable welds are not necessarily perfect. A limited number of minor imperfections might be permissible depending upon their location, size and spacing.

On the following pages we have listed some of the most commonly used qualification tests. These are arranged in tabular form for easy reference.

TRAINING
MAINTENANCE
WELDORS

Qualification Testing Procedure

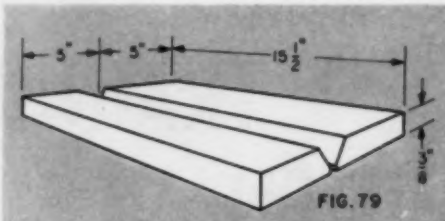


FIG. 79

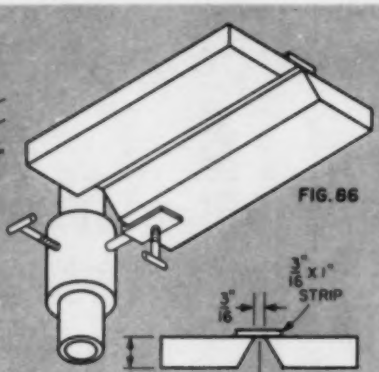


FIG. 86

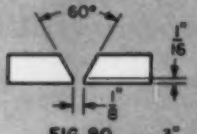


FIG. 80

NOTE:
WELDED FROM ONE SIDE
WITH NO BACKUP WELD
OR BACKUP STRIP

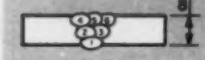


FIG. 81

FIG. 82

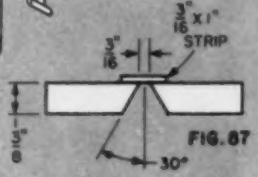


FIG. 87

FIG. 88

TYPE OF JOINT	**GROOVE WELD**—Single Vee Butt Joint. This is a face bend, root bend and tensile strength specimen.	**GROOVE WELD**—Single Vee Butt Joint with Backup Strip. This is a face bend, root bend and tensile strength specimen.
MATERIAL USED	Carbon silicon steel plate ASTM, A-201 grade A or ASTM, A-7	Carbon silicon steel plate ASTM, A-201, Grade A or ASTM, A-7
MATERIAL THICKNESS	3/8 or 1/2 in.	3/8 or 1/2 in.
WELDING POSITION	Flat	Overhead
ELECTRODE TYPE	AWS, E-6010, 3/16 in. dia. 1/8 or 5/32 in. dia. for root pass	AWS, E-6010, 1/8 in. dia.
WELDING CURRENT	D-c reverse polarity-1/8-100 amps, 5/32-140 amps, 3/16-160 amps. A-c may be used but electrode must be changed to AWS, E-6011	D-c reverse polarity 110 amps. A-c may be used but electrode must be changed to AWS, E-6011
MATERIAL PREPARATION	Oxyacetylene cutting and beveling. Offhand grinding. See Figs. 79 and 80	Oxyacetylene cutting and beveling. Offhand grinding. See Figs. 86 and 87
WELDING TECHNIQUE	Stringer-bead welding, 3/8 in. thickness-6 passes 1/2 in. thickness-10 passes See Figs. 81 and 82	Stringer-bead welding 3/8 in.-6 passes 1/2 in.-9 passes See Fig. 88
PREPARING TEST SPECIMENS	See Figs. 83, 84 and 85	Remove backup strip with torch See Figs. 83, 84 and 85

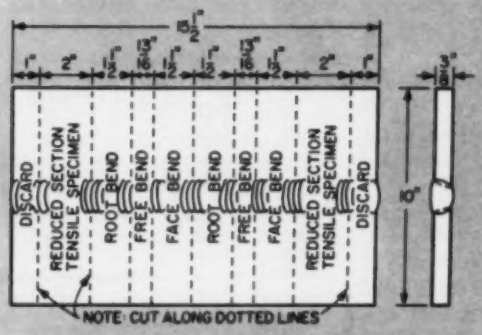


FIG. 83

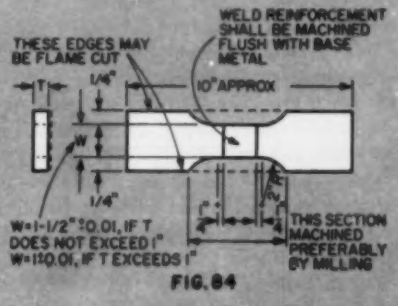
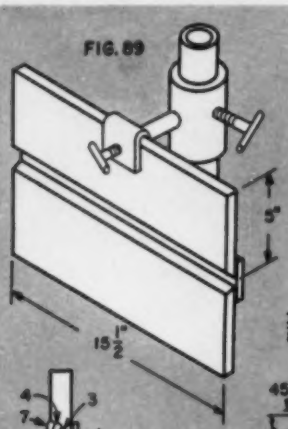


FIG. 84



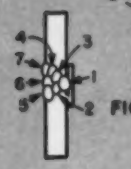


FIG. 91

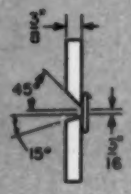


FIG. 90

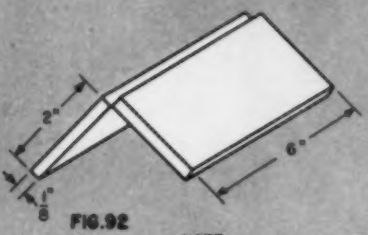


FIG. 92

NOTE:
100% PENETRATION
IS REQUIRED

FIG. 93

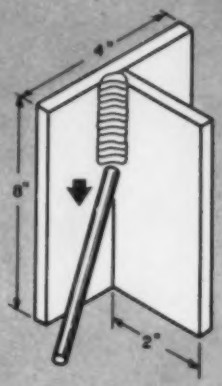


FIG. 94

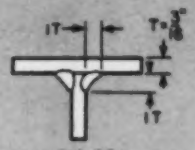


FIG. 95

GROOVE WELD—Single Vee Butt Joint with Backup Strip. This is a face bend, root bend and tensile strength specimen.	**FILLET WELD**—Open Corner Joint. This is a root bend test specimen.	**FILLET WELD**—Double-Welded Tee Joint. This is a face bend tee joint specimen.	**FILLET WI** This is a
Carbon silicon steel plate ASTM, A-201, Grade A or ASTM, A-7	Mild carbon steel plate ASTM, A-7	Mild steel carbon plate ASTM, A-7	Mild carb ASTM, A-
⅜ or ½ in.	⅛ in.	⅛ in.	3/16 in.
Horizontal	Flat	Vertical	Horizonta
AWS, E-6010, 5/32 in. dia.	AWS, E-6013, ⅛ in. dia.	AWS, E-6013, ⅛ in. dia.	AWS, E-6
D-c reverse polarity 140 amps. A-c may be used but electrode must be changed to AWS, E-6011	A-c or d-c straight polarity 90 amps	A-c or d-c straight polarity 90 amps	D-c straig
Oxyacetylene cutting and beveling Offhand grinding. See Figs. 89 and 90	Heavy squaring shear, metal cutting band saw or slitting shear. See Figs. 92 and 93	Heavy squaring shear, metal cutting band saw or slitting shear. See Figs. 94 and 95	Heavy sq band saw See Figs.
Stringer-bead welding ¾ in.-7 passes ½ in.-11 passes See Fig. 91	Single-pass fillet weld with 100 per cent penetration. Depth of weld throat must be 1 T.	Single pass fillet welds. Weld vertical down.	Weld wit
Remove backup strip with torch. See Figs. 83, 84, and 85	No preparation required	Cut on metal cutting band saw as shown in Fig. 96	No prepa

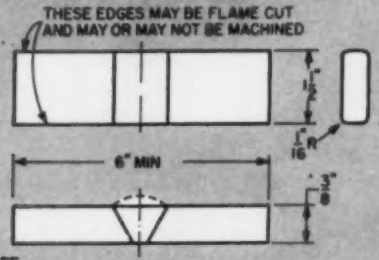


FIG. 85

NOTE:
WELD REINFORCEMENT AND BACKING STRIP, IF ANY, SHALL BE REMOVED FLUSH WITH THE SURFACE OF THE SPECIMEN IF A RECESSED STRIP IS USED THIS SURFACE OF THE SPECIMEN MAY BE MACHINED TO A DEPTH NOT EXCEEDING THE DEPTH OF THE RECESS TO REMOVE THE STRIP.

NOTE:
CUT ALONG DOTTED LINES

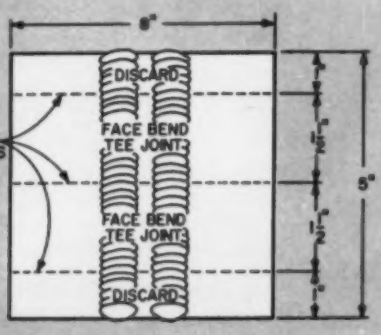


FIG. 96

FIG. 10

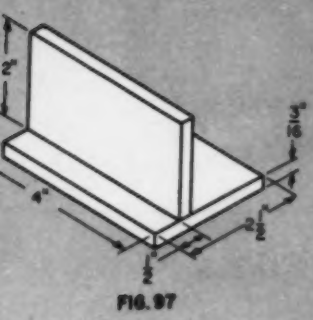


FIG. 97

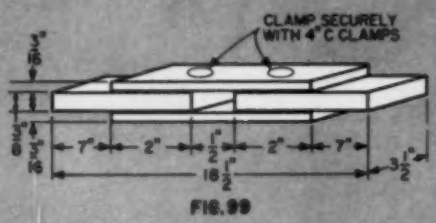


FIG. 99

FIG. 98

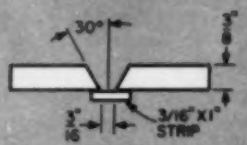


FIG. 102

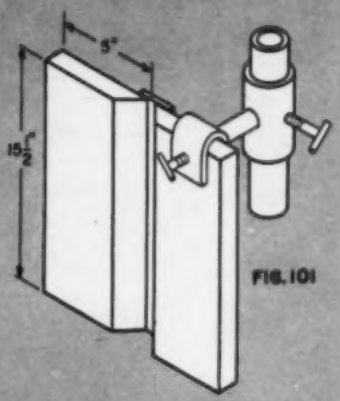
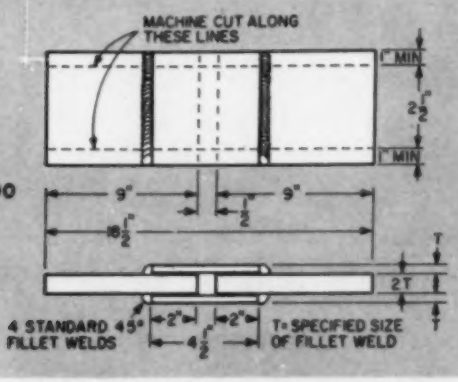


FIG. 101

ET WELD—Single Welded Tee Joint. is a root bend fracture specimen.	**FILLET WELD**—Lap Joint. This is a transverse fillet weld shear test specimen.	**GROOVE WELD**—Single Vee Butt Joint with Backup Strip.
l carbon steel plate M, A-7	Mild steel carbon plate ASTM, A-7	Carbon silicon steel plate ASTM, A-201, Grade A or ASTM, A-7
n.	⅜ and 5/16 in.	⅜ in.
zontal	Horizontal	Vertical
S, E-6012, 5/32 in. dia.	AWS, E-6010, ¼ in. dia.	AWS, E-6010, 5/32 in. dia.
straight polarity 160 amps	D-c reverse polarity 160 amps. A-c may be used if electrode is changed to AWS, E-6011	D-c reverse polarity 140 amps. A-c may be used if electrode is changed to AWS, E-6011
vy squaring shear, metal cutting l saw, or slitting shear. Figs. 97 and 98	Oxyacetylene cutting or sawing. No beveling required. See Fig. 99	Oxyacetylene cutting and beveling, offhand grinding. See Figs. 101 and 102
d with single pass ¼ in. fillet	Single pass ¼ in. fillet welds. See Fig. 100	Weld vertical up. Use stringer bead for first pass. Make second and third passes weave bead. See Fig. 103
preparation required	See Fig. 100	Remove backup strip with torch. See Figs. 83, 84 and 85

FIG. 100



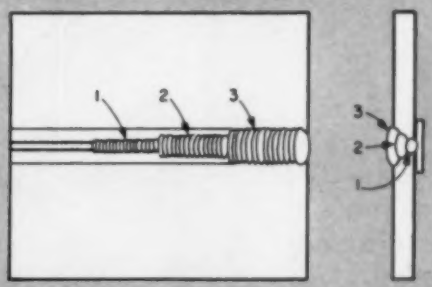


FIG. 103

INDUSTRIAL BUILDING CONFERENCE Program
New York Coliseum—September 25, 26, 27

PLANT ENGINEERS facing problems of planning new industrial construction or modernizing existing facilities will find many of their questions answered at the Industrial Building Congress to be held at the New York Coliseum in September.

The various sessions planned for this conference will cover virtually every aspect of new building construction and modernization. Beginning with site selection, the conference program will include discussions on evaluating contracts, financing, foreign construction, heating and air conditioning, selection of architect and builder, lighting, costs, providing for expansion, and developments in construction methods and materials.

A brief report of the topics and speakers, drawn from a wide variety of industries, is presented here to help you plan your activities during the three-day conference.

Monday, September 25, 9:30 a.m. to noon

1. Top Management's View of Industrial Buildings

Speakers: Richard B. Sellars, Chairman of the Boards of Ethicon, Inc., and Ortho Pharmaceutical Corp., both of New Brunswick, N. J.; Maurice Saltzman, President, Bobbie Brooks, Inc., Cleveland, and H. Campbell Stuckeman, Vice-President—Real Estate, Rockwell Mfg. Co., Pittsburgh, Pa.

Monday, September 25, 7:30 p.m. to 9:30 p.m.

2. Aspects of a Plant Location Study

Setting Up and Coordinating a Plant Location Search

Speaker: B. C. Booth, Vice-President—Manufacturing, Amphenol-Borg Electronics Corp., Broadview, Ill.

Hiring New Employees and Moving Present Ones

Speaker: Dr. G. Roy Fugal, Manager—Employment Practices, General Electric Co., New York.

Public Relations Essentials in Selection of a Location

Speaker: William F. Weimer, Director of Advertising and Public Relations, Rockwell Mfg. Co., Pittsburgh.

3. Evaluating Contracts

Segregated Contracts vs. General Construction Contracts

Speaker: J. D. Petersen, Manager, Engineering Division, Goodyear Tire & Rubber Co., Akron, O.

Comparison of Open, Invitation and Negotiated Bidding

Speaker: Clayton E. Mullins, Manager of Construction Division, Engineering and Construction Department, Atlantic Refining Co., Philadelphia.

Analyzing Construction Contract Features—Penalty Clauses, Performance Bonds, Etc.

Speaker: Louis Menk, A.I.A., Associate, Albert Kahn Associated Architects & Engineers, Inc., Detroit.

4. Advantages and Disadvantages of Leaseback Financing

Speaker: Gustave Simons, attorney and economist, New York.

5. Initial Costs vs. Ultimate Costs as Related to Requirements

Speaker: Gerald P. Gaffney, Manager, Corporate Facilities, Martin Co., Baltimore.

Tuesday, September 26, 9:30 a.m. to noon

6. Comparing Design and Construction Approaches in Other North American Countries

Speakers: Felix Candela, Architect, Cubiertas, ALA. S. A., Mexico City.

Interrogators: Charles R. Colbert, Dean, School of Architecture, Columbia University, New York, and Robert W. McLaughlin, F.A.I.A., Director, School of Architecture, Princeton University, Princeton, N. J.

Tuesday, September 26, 7:30 p.m. to 9:30 p.m.

7. Current Practices in Heating, Ventilating and Cooling in Modern Plants

Speaker: Russell F. Stem, Associate, Smith, Hinchman & Grylls Associates, Inc., Detroit.

Inside . . .

complete chart of weldor's Qualification Testing Procedure

8. The Effect and Produc

Speaker: R gineering, We

9. Criteria in in Foreign

Speaker: W neering Divisi

10. New Thin Lighting

Speaker: Giffels & Ross

11. Developin Costs Per

Speaker: Kidde Constru

12. Expansion

Converting

Speaker: W ities and Field

Planning

Speaker: B Department, W

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13. Developing tion of Ind

In Estimat

Speaker: M Hastings, Den

In Designi

Speaker: W neer, Design du Pont de Ne

In Reducin

Speaker: N Planning and C

Effect of Building Design on Employee Morale roductivity

r: Robert F. Dennig, Superintendent, Plant En-, Western Electric Co., New York, N. Y.

ia in Selecting Architect and Builder for Work eign Countries

r: William G. Meier, Assistant Director, Engi-Division, Parke, Davis & Co., Detroit.

Thinking in Achieving Efficient and Economical ing

r: Fred L. Lantz, Senior Lighting Engineer, Rossetti, Inc., Detroit.

loping a Uniform System to Compare Standard Per Foot

r: Frank L. Whitney, Vice-President, Walter onstructors, New York.

nsion Problems and Solutions

erting Old Utility Systems to Larger Needs

r: W. H. Sisson, Chief Engineer, Services, Util-Field Construction, Upjohn Co., Kalamazoo.

ing Expandability into Your Plant

r: Burr Tupper, Director—Works Engineering nt, Westinghouse Electric Corp., Pittsburgh.

ay, September 27, 9:30 a.m. to noon

loping More Effective Procedures for Construc-f Industrial Buildings

imating

r: Milo S. Ketchum, Jr., Ketchum, Konkel & Denver.

signing Suitable Facilities

r: Walter M. Carlson, Senior Computer Engi-ign Division, Engineering Department, E. I. e Nemours & Co., Inc., Wilmington, Del.

lucing Construction Delays

: Nathaniel M. Martin, Director, Facilities nd Construction, IBM Corp., New York.

14. Effective Procedures for the Owner Who Builds Infrequently

Deciding on What to Build

Speaker: Carl E. Elmendorf, Manager, Plant Engineering, Haloid Xerox, Inc., Rochester, N. Y.

Criteria in the Selection of an Architect and Builder

Speaker: John B. Ortman, Manager—Plant Engineering Services, Sprague Electric Co., North Adams, Mass.

Coordination Required to Insure Control of Costs and Schedule

Speaker: Michael V. Cosentine, Manager—Engineering, E. R. Squibb & Co., New Brunswick, N. J.

Wednesday, September 27, 2:00 p.m. to 4:30 p.m.

15. Management of the Company's Engineering Staff for Facilities

What Is the Department's Relationship to the Rest of the Company?

Speaker: R. J. Short, Director, Engineering Exploration, Procter & Gamble Co., Cincinnati.

Relationship With Outside Architects, Engineers and Builders

Speaker: James A. MacAlarney, Director, Plant Engineering Office, Ford Motor Co., Dearborn, Mich.

Keeping Control of Costs and Schedule

Speaker: Paul H. Van Wert, Director, Facilities Planning, Sylvania Electric Products, Inc., Williamsport, Pa.

16. From Management Decision to Operation in One Year

Speakers: A team of executives from Philco Corp.

17. Modernizing Your Facilities

Some Low Cost Methods of Modernizing Plants

Speaker: Wendell Anderson, Director of Facility Planning, AMP, Inc., Harrisburg, Pa.

When Do You Modernize vs. Building a New Plant

Speaker: Richard B. Dejaeger, Manager, Architectural and Structural Design Division, Deere & Co., Moline, Ill.

18. Developments in Construction Methods and Materials

Getting Longer Life From Slab-on-Ground Concrete Industrial Floors

Speaker: Armand H. Gustaferro, Supervisor, Construction Engineering, Portland Cement Assn., Chicago.

An Analysis of Prestressed Steel

Speaker: T. R. Higgins, Director of Engineering and Research, American Institute of Steel Construction, Inc., New York.

Curtain Walls—Their Present Status and Future

Speaker: Dudley Hunt, Jr., Senior Editor, *Architectural Record*, New York.

New Opportunities for Use of Structural Foams

Speaker: Joseph L. Waling, Professor of Structural Engineering, Purdue University, Lafayette, Ind.

19. Making More Effective Use of Building Models

Speaker: R. E. Buenting, Superintendent of Manufacturing, Westinghouse Electric Corp., Staunton, Va.

End

SUPPLY SYSTEMS FOR INSTRUMENT AIR

Which supply system is best for you? Here are brief descriptions to help you select the right one

By **RICHARD E. FREY**, Systems Application Engineer, Fischer and Porter Company

A DEPENDABLE supply of clean, dry compressed air (or gas) is a "must" to insure satisfactory operation and to reduce maintenance of a pneumatic instrument system.

Moisture, oil, corrosive liquids, or solid particles carried into the pneumatic system from the air supply will eventually block pilots and other restricted passages in instruments and control element actuators. This is perhaps the greatest problem encountered in pneumatic instruments which will otherwise offer dependable, virtually maintenance-free service.

The extent of treatment required to obtain suitable instrument air depends on the source of the air, the amount required, and the range of temperatures to which air lines will be exposed. Air used to drive cylinders or pneumatic machinery is not included in this discussion.

The most common source of instrument air is direct atmospheric intake. For design purposes, this air is considered to be saturated and at a typical summer temperature. This air requires compression, filtration and drying. When plant air is used, only drying is necessary, as well as pressure reduction. If bottled gas such as nitrogen is used, no treatment is required.

When natural gas is used, its properties will vary with its source. It should be checked for corrosive ingredients as well as moisture. Filtration and pressure regulation will be necessary.

The air must be dried in such a way that its final dew point, as delivered to the supply header, is below the lowest temperature encountered anywhere in the system. This value will vary with the season of the year. The dew point should be based on the lowest winter temperature expected, with a 10 F safety margin.

If all air lines are inside a heated building, a suitable dew point may be obtained by removing water in the compressor aftercooler, or in a simple condensing filter, without the use of dehydrating equipment. Likewise, it may be possible to eliminate dryers if outside air lines are steam-traced. However, there is the danger that condensation will occur in the instrument itself if it is located outdoors without auxiliary heating.

In sizing an air supply system, allow 0.5 scfm for each air pilot and 0.75 scfm for each valve positioner. This is considerably in excess of the rated steady state consumption of instrument pilots; however, the system must be designed to take maximum upset conditions and to allow for leaks, blowdowns, and operating faults that result in wasted air.

Remember that each pilot must be counted and that some instruments have more than one air pilot. Control valves are not counted unless they use positioners because the air used to drive the valve is exhausted through a pilot already included in the count. The total thus arrived at may be considered the maximum system demand and this figure should be used to size the receiver.

In order to avoid overloading the compressor, add 15 to 20 per cent to the maximum system demand in order to arrive at the compressor capacity. Note that the standby compressor is not counted upon to handle any of the load unless the first compressor fails completely. Thus both compressors must be sized to handle the rated compressor capacity calculated above.

Instrument Air for Large Installations Using 5 scfm or more

The air intake should be located at a point where the atmosphere is as clean and cool as possible. Intake filters keep out dirt and dust and should be cleaned regularly to insure maximum compressor efficiency.

A standby compressor is essential in a large system; its cost is negligible compared to the price of a plant shutdown resulting from instrument air failure. Each compressor is sized to handle maximum air demand. An interlock system should be provided to automatically start up the spare compressor when air receiver pressure drops below a safe minimum.

The aftercooler removes heat added by compression, and thereby condenses out some of the water in the air. A trap is provided to remove this condensate before it gets into the receiver.

The receiver serves to provide capacity in the system and absorbs surges caused by fluctuating air demand. A relief valve is always installed on the tank regardless of its size.

After the receiver, a filter or series of filters must be installed to remove oil and pipe scale entrainment. This material cannot be allowed to get into the dryers where it would contaminate the desiccant and finally be carried into the system.

(Please turn page)

AIR SUPPLY SYSTEMS

To prevent formation of rust particles, use only brass, copper, galvanized iron, stainless steel, aluminum, or plastic piping throughout the air system after the receiver.

The dryer is the final stage of treatment before the air enters the header. By the time the air enters the dryer, it has already lost some moisture and is relatively free of oil and solid particles. The dryer must have two or more desiccant chambers so that each chamber can be automatically regenerated without interrupting the flow of dry air to the header.

As an option, a self-actuated pressure reducing valve installed at the header provides a fairly constant pressure for plant-wide distribution. This permits more satisfactory operation of the local pressure-reducing stations by maintaining a constant upstream pressure.

This pressure regulation is especially useful where there are rapid and wide variations in air demand, or where the total air piping system has a relatively low capacity. The reduced header pressure should not be set below 45 psig, in order to tolerate routine leaks and piping system pressure drops. The pressure at the local instrument pressure regulator should be at least 25 psig to allow efficient operation of the regulator.

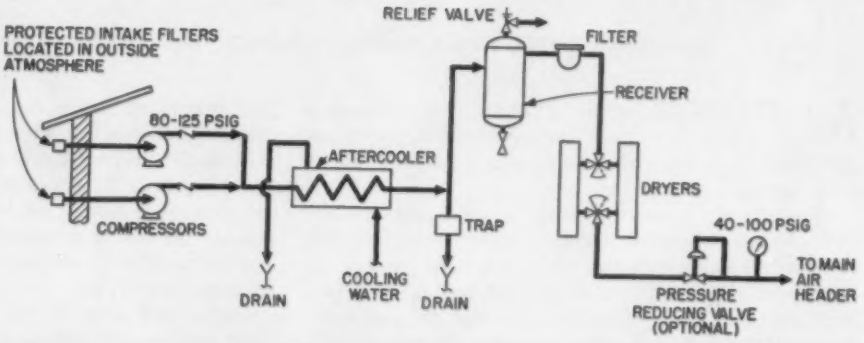


Fig. 1. Sketch shows the various components required for a large installation using 5 scfm of instrument air or more.

Where an Ample Supply of Plant Air Is Available

It is always best to have a completely independent instrument air supply system. Plant air usage is sometimes unpredictable, and wide fluctuations in header pressure are not uncommon when pneumatic machinery is started up. For this reason, a self-actuated back-pressure regulator is essential, installed immediately downstream from the instrument air take-off point.

The connection for instrument air should be made at the plant air receiver itself. If this is not possible, a connection on the header may be made, provided it is upstream of all other plant air supply connections. The back-pressure valve will shut whenever plant air pressure falls below its set minimum, preferable at least 80 psig. When the valve shuts, the instrument air system is supplied with all plant air available.

A pressure reducing valve is required to reduce pressure from 80 to 125 psig, and to smooth out surges.

The aftercooler, filter and dryer units serve the same functions as discussed above. A receiver is not needed if one is already provided in the plant air system.

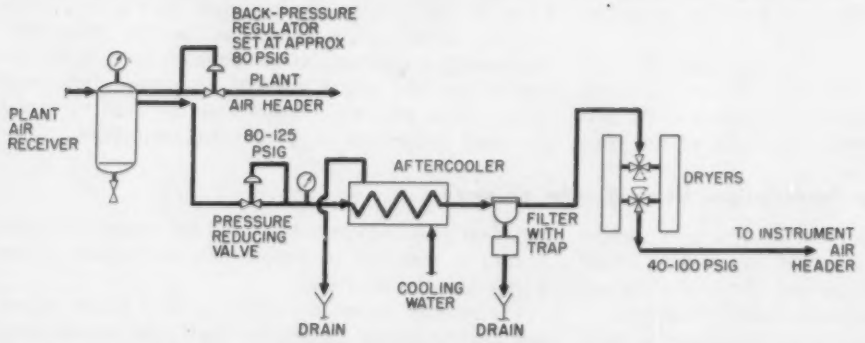


Fig. 2. Here is how instrument supply system should be arranged if air supply of plant is ample.

Where the Air Intake Is Indoors in a Heated Building

Here the dryer may be eliminated. Small capacity compressors are furnished mounted on a receiver tank. To this system must be added a cooler and filter with trap. Separate units may be employed or a condensing type filter. The standby compressor is recommended unless usage is only occasional. If any of the air supply lines are run outdoors, a scaled down version of Fig. 1 should be used.

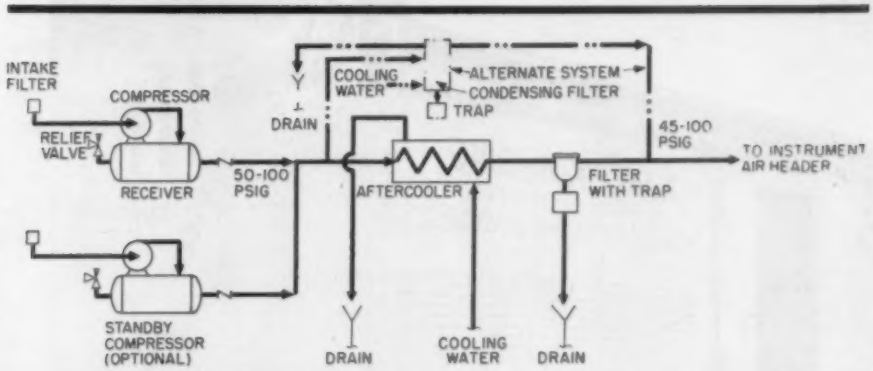


Fig. 3. Several changes will have to be made to supply system if air intake is in heated building.

Equipment Selection

Compressors of three types are used for instrument air: (1) oil-lubricated type, (2) carbon ring lubricated type, and (3) water-sealed rotary type. The drive may be electrical or steam turbine.

The least expensive of these is the standard oil-lubricated compressor with electric motor drive. Oil, however, cannot be prevented from entering the air stream. The amount of oil entrained in the air increases with overload and wear on the compressor.

Once oil gets into the air stream, it cannot be removed entirely. The fine mist which escapes filtration eventually gums up instrument pilots and valve positioners. This requires periodic routine maintenance on compressors and air pilots as well as cleaning of filters.

The carbon ring lubricated compressor is more expensive but uses no oil. This cuts down on instrument maintenance but the compressor rings must be inspected periodically to check for excessive wear and disintegration. Particles of carbon from defective rings may plug up instrument restrictions and are difficult to clean out. This problem is minimized by the use of filters both on the primary air supply system and at the instruments.

The water-sealed rotary compressor uses no oil or carbon rings but its cost is higher than the other types, and its output pressure is limited to about 70 psig. This type is preferred where maintenance crews are not staffed to cope with the problems mentioned above. Furthermore it requires no aftercooler since the sealing water also acts to cool the air during compression.

The aftercooler is simply a heat exchanger using water as a coolant. Cooling to about 15 F higher than available cooling water temperature is sufficient and economical. The more water dropped out in the aftercooler the less the load on the dryer. In small installations where there is no dryer, the aftercooler or condenser must cool the air below the lowest temperature in entire air system.

In general, the aftercooler for a single stage compressor discharging at 100 psig or less requires surface area and cooling water for 100 scfm of air as shown in the following table.

Cooling Water Temperature, Degrees F	50	60	70	80	90
Cooling Surface, sq ft	15	16	17	20	23
Cooling Water, gpm	3.6	4.0	4.5	5.2	6.0

The figures given in the table are for rough estimating purposes only. For a specific installation, follow recommendations of a heat exchanger manufacturer.

The air receiver should be sized to hold a volume of air equal to 15 minutes maximum usage. Do not base the size on actual compressor capacity, because the compressor is deliberately oversized to prevent overloading. It is advisable to specify an ASME coded vessel to avoid difficulty with local ordinances or insurance provisions. A safety valve, pressure gage and drain connection must be furnished. Gage glass connections are also advisable.

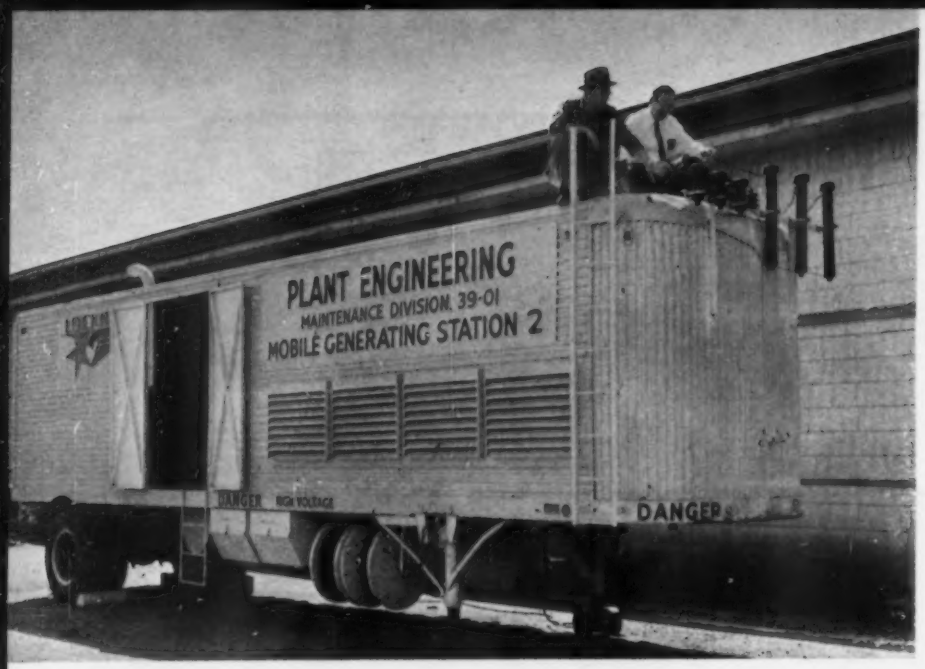
Filters are essential when an air compressor of the oil-lubricated type is used, and should also be used with the other types of compressors. A porous stone type of filter medium is generally the best for oil removal. When oil is a problem, select filter recommended for oil removal.

Filters must be provided in two or more units, piped in parallel, to allow cleaning of each without interruption of air supply. Solvent type filters are not recommended; although efficient in removing oil, they present the problem of later removal of solvent picked up by air.

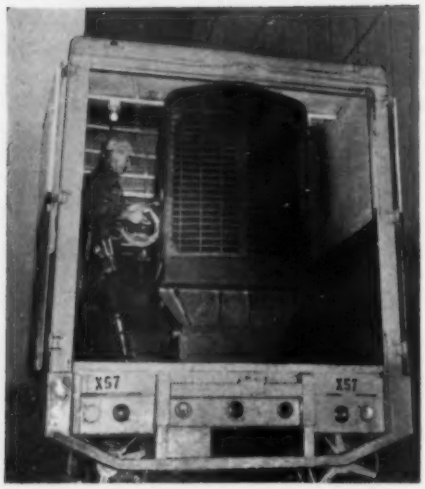
Dryers—The most commonly used type of dryer is that employing a solid desiccant, such as aluminum oxide or silica gel. These dryers are furnished with two or more desiccant chambers and automatic regeneration on a fixed time cycle basis. Regeneration may be accomplished with steam, electric heating element, or recycling dry air.

The regeneration cycle should be eight hours or more. As the filter beds become contaminated and the gel becomes granulated, use of the dryers can be continued by cutting down the time cycle. This is not possible if the cycle on which the dryers were designed is already at its minimum. No dryer which uses heat for regeneration should be operated on a cycle of less than two hours.

Dryers using recycled dry air for regeneration are sometimes desired because no heating medium is required. However, 40 per cent of the dry air must be recycled for regeneration purposes on a cycle of approximately two minutes; this sometimes increases the necessary capacity of the compressor. Because of its extremely frequent regeneration, this type of dryer will give a dew point as low as minus 80 F. The dryers employing heat for regeneration are generally not furnished below a minus 40 F dew point. **End**



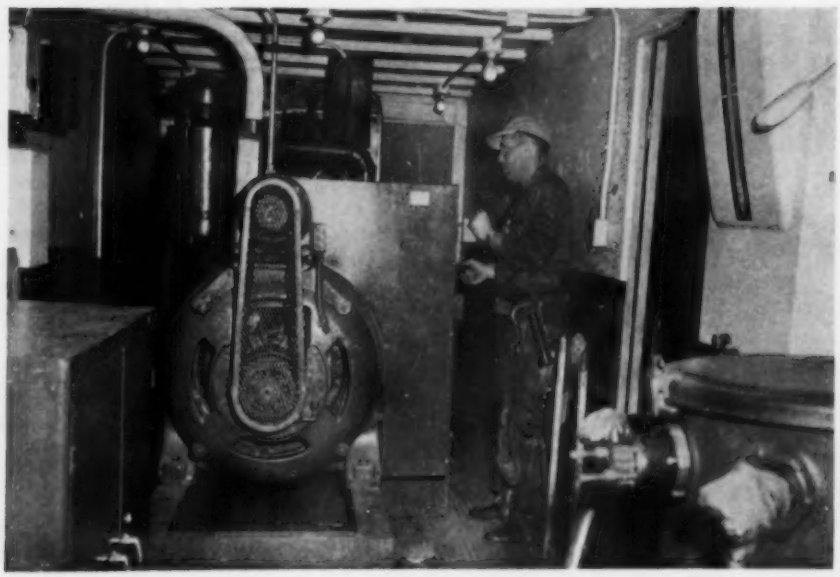
P. D. Hill, Supervisor, left, and Joe Delany, Electrical Maintenance Foreman, discuss connections to 12,000 volt line.



Plant Engineered MOBILE GENERATORS FILL POWER GAPS

By **E. J. DOCEKAL**, Plant Engineer
Lockheed Aircraft Corporation, Marietta, Georgia.

Side and rear doors of trailer are opened when unit is running to provide ventilation for diesel engine.



H. E. Wheeler, Lockheed lineman, prepares to start 250-hp Buda diesel coupled to the generator for test run.

DESIGNED and constructed by the Plant Engineering Department, two mobile generator units provide insurance against production delays at Lockheed Aircraft Corporation, Marietta, Georgia. Ready for emergencies on short notice, the units were built mainly from reclaimed materials to reduce costs.

Both trailer generating stations provide portable electric power service for any 110/208, 220, 440, 4160, or 12,000 volt requirements up to either 156 kva or 128 kw, depending upon the unit in use. The higher capacity unit is powered by a 250-hp Buda diesel engine which drives a 156 kva, 440-v, 3 phase generator. The second unit is powered by a Waukesha diesel, driving a 125 kw, 60 cycle, three phase generator.

Both units employ the same basic circuitry in their design. Various voltages are obtained by stepping the generated 440 volts up to 2400 volts by means of transformers which feed a 2400 volt bus located in the forward part of the trailer. From this 2400 volt bus, other transformers are used to obtain 110/208, 220, 4160 or 12,000 volts. Any 440 volt requirements are supplied directly from the generator.

A 36-v battery is used for starting the diesel engine. Special wiring and a battery charger permit charging from normal electric service when the generator is not operating. Both units get a trial run each week to make sure they will run when needed.

Standard receptacles have been provided for quick hookup to any equipment needing power. Large cable reels, holding various sizes of cables, are bolted under the trailer for easy accessibility. A cabinet inside the trailer holds many of the standard electrical items needed for repairs. In addition, four spray cans of ether are stored here for starting the diesel engine on cold days.

Both units were built at a cost less than $50,000 or less than half the cost of equivalent new units. This economy was achieved by careful, selective shopping for component parts. The trailers were purchased from the used truck market, reconditioned by Plant Engineering, and then adapted to mobile generator requirements. The diesel generator units were almost as good as new after rework, yet cost half the price of new ones.

Modification of both the trailers and their equipment was carried out under the supervision of J. H. Delany, Foreman of Electrical Maintenance, assisted by various members of the Plant Engineering Departments.

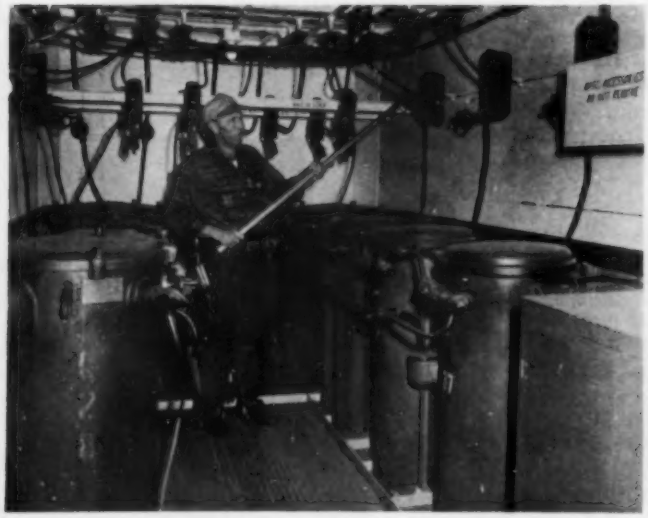
Either of the units can be placed in operation anywhere on the 1000-acre plant within 20 to 45 minutes after an emergency call has been received. Two men are all that are needed to operate the unit, check safety requirements and provide the desired power connections. Approximately 10 employees have been trained in emergency use of the equipment.

Typical use of these mobile power plants, either one capable of supplying power and lights to a 150-home community, ranges from supplementary power supply to disaster work in adjoining communities. As an example, some time ago orders were given to speed up modifications of B-47 Stratojets. This step-up in production soon caused an overload on plant circuits and both mobile units were pressed into service to relieve the situation.

Last year a heavy ice storm disrupted power lines serving communities adjacent to Marietta. One of these, Smyrna, Georgia, two miles from the plant, acts as the nerve center for Civil Defense operations for the area. One of the mobile generators was pressed into service to keep the Civil Defense transmitter operational until normal power was restored.

Failure of a feeder between the jet fuel farm and a sewage disposal plant suspended operations at the disposal plant. A mobile unit was hooked up in 30 minutes and kept the plant operating for 36 hours until repairs to the feeder were completed. When transformers supplying power to the forced draft blowers in the boiler room failed, the mobile units substituted for two days while repairs were made to the transformers. **End**

Inserting fused cutouts in 4160 volt line. Power is generated at 440 volts and stepped down to 110/208 and 220 volts or up to 4160 or 12,000 volts by these transformers.



Requirements of 440 volt are taken directly from generators. This bank of fused switches and quick disconnect plugs permit rapid connections to meet emergencies.

Fig. 1. General view of finished stock racks. Note 4-in. channel base, welded to each upright, and slope of arms that hold stock.

STORAGE RACKS from H-BEAM SCRAP

SCRAP H-BEAMS salvaged from an unused overhead crane track, a cutting torch, and an idea resulted in some convenient, compact, and fully adjustable steel storage racks. They are being used for heavy bars and extrusions in the shops of the H. A. Seele Corporation, at Los Angeles, California.

Some 8-ft uprights were torch-cut from the 6-in. wide flange shapes. Each upright face was drilled at intervals along the flange so that the stock-holding extension arm could be adjustable in height. A pair of 3-ft long, 4-in. channels were welded at the bottom of each upright to form a base as shown in Fig. 1.

Next a number of 18-in. sections were cut from 8-in. H-beams. Stock-holding extension arms were cut from these sections, as shown in Fig. 2, by cutting diagonally across the web of the beam section.

Outlining a small nub on the bottom of the web on each arm, to fit into the locating holes on the upright, the web section was cut back at a slight angle up to the flange. An elongated "C" cut was then made in the flange on the nub end, sized to fit over the flange on the 6-in.upright.

Figure 3 shows how the stock-holding extension arms are slipped down over the 6-in. upright from the top. The nub fits into the holes on the upright to position the arm. A slight angle backcut on the web causes the arm to tilt upward at the outer end, thus keeping the stored bar stock in place on the arms. **End**

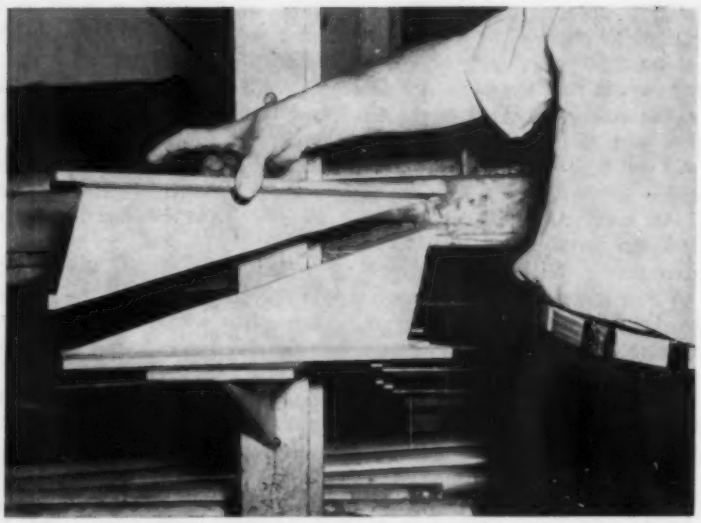
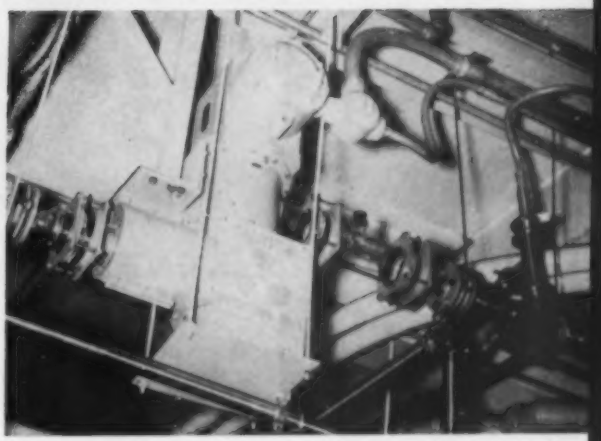


Fig. 2. Two stock-holding extension arms were cut from each 18-in. section of 8-in. H-beams. Note the nubs which are left on to fit into holes on upright.

Fig. 3. Elongated "C" cut into flange of arm slides down over upright from the top and is positioned by fitting nub on arm into hole in flange of upright.

CONSIDERATIONS FOR APPLYING NUCLEAR GAGES TO PROCESS CONTROL



In this measuring assembly, product flows from left through glass pipe, then out at right to packaging. Radiation source is mounted at lower end of S pipe; temperature regulated conversion cell at upper end.

NUCLEAR GAGE measurement of densities and levels is steadily increasing in processing industries. Information on this subject has been collected by Philip E. Ohmart, President of The Ohmart Corporation, Cincinnati, Ohio, and is summarized to help you evaluate nuclear gage applications as possible solutions to a particular problem.

A typical nuclear gage consists of two major parts: the measuring assembly and amplifier/indicator. Within the measuring assembly are the components: a radioactive source, usually cesium 137 or cobalt 60, and the radiation detection cell. These are contained within castings, for clamping to the existing process pipe or mounting directly into the process line. The radiation source is enclosed in a lead shield and shutter combination, allowing the radiation to pass only through the process pipe to the detector cell. This eliminates any radiation hazard to nearby workers.

In operation, the radiation source is positioned on one side of the line. Opposite is mounted a detection cell. Radiation passing through the pipe and material in process is converted directly into electrical energy by the detection cell. Amount of radiation reaching the detection cell is related to percentage of solids in the system. Through this, direct measurement of specific gravity or per cent of solids is obtained.

In measuring product density, it is usually desired to start from a fixed reference point and amplify changes as much as possible. By this means, greater sensitivity and accuracy can be obtained. For instance, to measure and control per cent solids in a water-solids mixture over a range of 0 to 10 per cent, the low end of the meter scale should read zero per cent solids and the high end 10 per cent.

To set zero per cent measurement, the process line is filled with water and a meter reading taken. Although the water and pipe stop some radioactive rays, the rest reach the detection cell. This energy is converted into an electrical signal and amplified to give a meter reading. When an opposite and equal electrical signal is fed into the amplifier, the two signals cancel one another and the meter reads zero. This is called zero suppression or compensation. In this example, when the meter is at zero, it equals water alone or zero per cent solids.

The second, or high, reference point is determined by filling the pipe with slurry or mixture of 10 per cent solids, or a solution bearing a specific gravity equivalent to 10 per cent solids, and again measuring the radiation transmitted through the pipe and solution. Radiation is again transmitted, converted, amplified and the meter adjusted for full scale deflection by the gain control. This is the second or high reference point, 10 per cent solids.

With this method, an instrument is calibrated for direct reading of per cent solids in a slurry over as narrow or as wide a range as desired. Differences as small as 0.1 per cent solids or 0.0003 specific gravity units can be accurately determined.

Two different types of amplifiers are generally applied in nuclear gaging systems. An a-c vibrating capacitor unit is used for maximum sensitivity and long term stability. Seldom is zero adjustment necessary. Combined with compensating cell zero suppression, the a-c amplifier provides the highest possible stability and accuracy.

Once in operation, the only adjustment normally required is a bi-monthly standardization to adjust for decay of the radiation source. The second type of gage uses a d-c amplifier with a single vacuum tube. This is used where requirements are less exacting and occasional electrical zero checking can be tolerated.

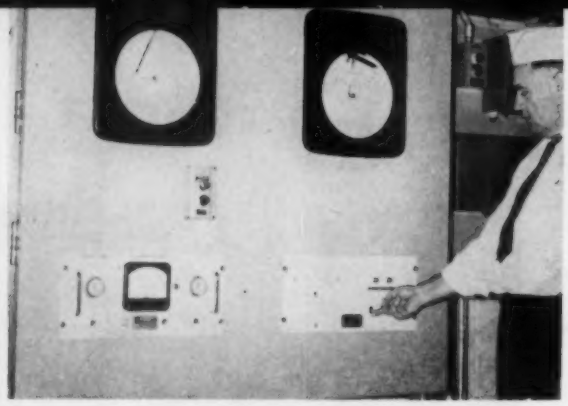
Three factors must always be considered in choosing the proper gage for solution of a given density measurement and control problem. These are: range of solids to be measured, accuracy desired and size of process pipe.

A relationship exists between the size of the process pipe and the maximum sensitivity or minimum span that can be measured. The table gives this relationship.

Pipe Size (inches)	Minimum Span (specific gravity)	Accuracy of Reading (specific gravity units)
4	0.100	±0.001
6	0.075	±0.00075
8	0.050	±0.0005
10	0.035	±0.00035
12	0.030	±0.0003
14	0.025	±0.00025

From this table, it is shown that as size of process pipe increases, the minimum span can be decreased. This results in increased sensitivity and narrower span of solids or gravity measurement.

When the size of the existing process pipe limits the



Operator shows switch which cuts off automatic alarm; this rings and stops proportioning pumps if product is not up to standard. Recording chart, upper left, keeps check on the quality of the product. Amplifier is located below this chart.

APPLYING NUCLEAR GAGES

minimum span, a special S-type transition section can be fitted into the process line. This expands the effective size of the pipe at the measurement point obtaining maximum sensitivity. Fluid velocity is maintained and turbulence created to avoid buildup of undesirable material.

For accuracy of calibration, a large number of samples should be taken to determine correlation with the nuclear gage. Since any single sample may reflect large statistical variations from the mean or true value, a minimum of 10 samples should be consecutively withdrawn. These should be evaluated individually and the degree of scatter determined. An average of these readings should be taken and compared with the scale reading. Sometimes, more than 10 samples are needed for proper calibration.

Since manual sampling is difficult, metallic absorbers for calibration are used for subsequent standardization. These are inserted into a special fixture located between the detection cell and the pipe, with the pipe empty. Absorbers are unchanging fundamental units, compared to electrical signals, subject to drift and instability with time. Metallic absorbers also automatically compensate for pipe wear or buildup. **End**

Foundry Sand Moisture Checked by Nuclear Method

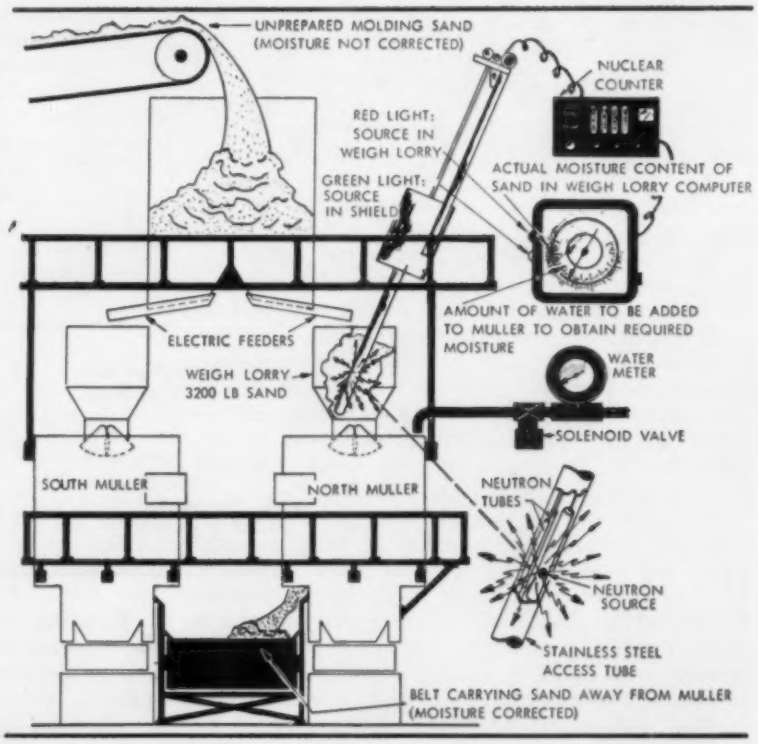
IT WAS BELIEVED that a better method could be found of sampling foundry sand for moisture at General Motors' Danville, Ill., plant. The method formerly used, according to GM's *Engineering Journal*, consisted of sampling the sand hourly and checking moisture content by comparing sand weight before and after drying.

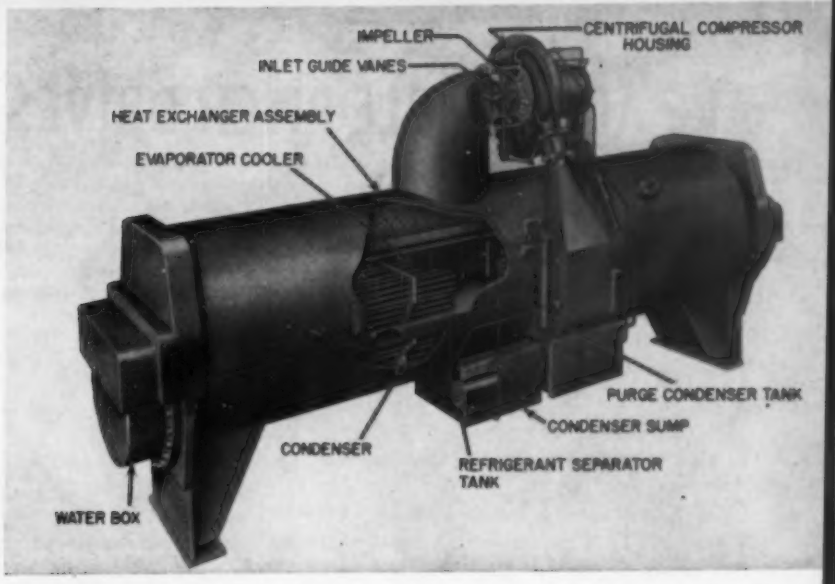
Two systems utilizing radioactive materials were investigated. Field tests indicated that one employing a source of fast neutrons and a detector sensitive to thermal neutrons only, had the greater possibility of success.

The system that was installed consisted of two mullers located next to each other and controlled by the same operator. Sand for the mullers comes from the same storage bin and the moisture gage is used in sequence to control each muller.

The weigh lorry is supported by a large scale. When 3200 lb of sand is fed into the hopper, the electric feeder is shut off and the same relay starts the automatic operation of the moisture gage. The pointer on the computer and the electronic and mechanical counters of the nuclear scaler, are reset to zero. The scaler starts counting and the computer starts simultaneously, thereby turning the indicator. When 100,000 neutrons have been counted, a relay on the scaler interrupts the power to the computer and the pointer indicates the moisture content of the sand.

After the sand is dumped, a water valve is energized to bring the moisture content of the sand to the desired level. Binding materials are then added to the sand in the muller which, after a predetermined time, is dumped into an outgoing vibrator. An elevator and belt system carries sand to the casting line. **End**


UNPREPARED MOLDING SAND
(MOISTURE NOT CORRECTED)
NUCLEAR COUNTER
RED LIGHT: SOURCE IN WEIGH LORRY
GREEN LIGHT: SOURCE IN SHIELD
ACTUAL MOISTURE CONTENT OF SAND IN WEIGH LORRY COMPUTER
AMOUNT OF WATER TO BE ADDED TO MULLER TO OBTAIN REQUIRED MOISTURE
ELECTRIC FEEDERS
WEIGH LORRY 3200 LB SAND
WATER METER
SOLENOID VALVE
SOUTH MULLER
NORTH MULLER
NEUTRON TUBES
NEUTRON SOURCE
STAINLESS STEEL ACCESS TUBE
BELT CARRYING SAND AWAY FROM MULLER (MOISTURE CORRECTED)



Cutaway shows construction of this new packaged centrifugal refrigeration machine.

Compact Packaged Chiller has 18,000 RPM Punch

A NEW hermetically-sealed centrifugal refrigeration machine by American-Standard is reportedly half as big, half as heavy as any conventional unit.

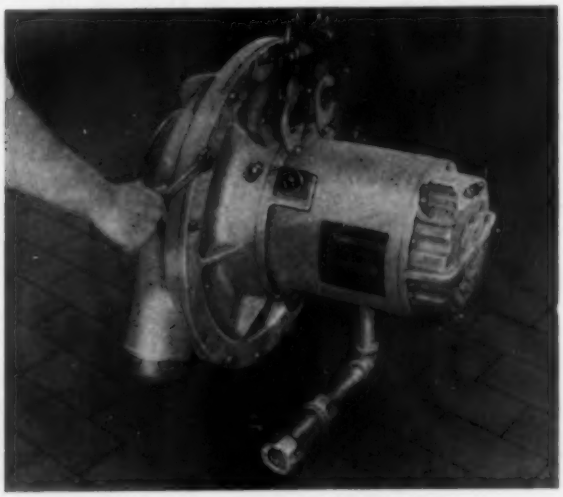
This packaged Tonrac is available in eight sizes from 50-ton to 100-ton refrigeration capacity. The complete unit is all piped and insulated requiring no auxiliary water piping, refrigerant piping or control tubing on the job site. It will pass through a standard 36-in. wide commercial doorway.

This compact design is possible because of a 300-cycle motor that operates at 18,000 rpm nominal speed on 480 v, 3 phase current supplied from a separate motor-generator-exciter power unit. The power unit generator can be operated from any rotary prime mover as well as the conventional 60-cycle line current and need not be located adjacent to the refrigeration machine.

In the 100-hp size, this motor weighs less than 1/10 as much as any conventional 60-cycle electrical motor of comparable capacity as commercially produced. The liquid-refrigerant-cooled windings and bearings makes this possible and also eliminates the need of a separate oil cooler.

Another major accomplishment claimed for the packaged design is the integral compressorless purge system. The purge compressor is the most common source of service troubles in refrigeration machines. In this unit the pressure differential, which always exists between condenser and cooler is utilized to exhaust foul gases from the condenser. This eliminates the need for the separate reciprocating compressor and associated troublesome oil heater, separator, water coil etc. **End**

This miniaturized 18,000-rpm motor weighs less than 1/10th as much as currently available commercial designs.



Want More Information?

For further details on this product and its application write "Tonrac" on one of the postage paid cards in this issue, or write to the Editor, Plant Engineering, 308 E. James St., Barrington, Illinois.

ARE ADJUSTABLE PITCH DRIVES CHEAPER THAN FIXED PITCH?

Yes, in some cases. Here's how to find out

By R. L. McMASTERS, JR., Allis-Chalmers Mfg. Co., Detroit, Mich.

HOW OFTEN do you find it necessary to readjust the speed of driven equipment because of "on the job" design changes? This problem is frequently encountered in fan and blower applications. Variations in sheet metal work on ducts carrying air directly affect friction losses in the system and fan pressure required.

Calculations for the volume and pressure of air to be supplied are often different from those demanded in actual installations. In addition, fans and blowers may deviate from performance curves used in design calculations.

This problem is easily solved where provisions to throttle the discharge side of the fan have been built into the air supply system. Where these provisions have not been made, it may be necessary to adjust the speed of the fan to secure desired operating performance.

In centrifugal fan applications, volume varies directly with speed, pressure varies directly with the square of the speed, and horsepower varies directly with the cube of the speed. As speed is the common denominator, it is easy to change the operating characteristics by merely changing the speed.

Where a fixed pitch drive is used this is normally accomplished by changing one of the sheaves. Usually the smaller motor sheave is changed, because of its lower cost.

With an adjustable speed drive, pitch diameter can be readily changed to regulate speed of the fan and achieve desired operating characteristics. In general, fan applications are figured with a 1.2 service factor and adjustable sheaves can adequately handle those applications using 1800-rpm motors up to and including 10 hp.

In many cases, users automatically decide against adjustable sheaves as they believe them to be more expensive. This is not necessarily true. Many drives designed with adjustable sheaves are less costly than a fixed pitch drive. This is borne out in a price comparison between fixed pitch and adjustable pitch drives, as shown in the table below.

These tabulations are based solely on a comparison of the motor sheaves involved and assume constant motor speeds, fan sheave diameter and center distance. All the drives selected for this comparison use the smallest pitch diameter (PD) motor sheave that will safely handle the design horsepower of the drive and still develop the desired speed. In addition. when an adjustable sheave is compared to a fixed PD sheave, it has been selected to fall approximately in the mid-range of the adjustable sheave.

In this comparison, the only difference is in the motor sheaves involved. High-capacity belts are utilized where such use is warranted, to achieve the minimum PD of driver sheaves and the minimum number of grooves. Conditions selected for this comparison are motor speed—1750 rpm, fan speed—1167 rpm. The resulting ratio, one and one half to one, was picked at random. **End**

Comparison of drives in one to 10 hp range shows adjustable pitch sheaves are less costly in some cases.

Motor Horsepower	Drive Catalog Number		Motor PD	Fan PD	Price Difference	Per Cent Speed Adjustment Higher	Lower
1	Std.	1A55	3.2	4.8		0	0
	Adj.	1A55	2.5/3	4.8	$1.25 less	9	22
1½	Std.	1AP55	3.6	5.4		0	0
	Adj.	1AP55	3.0/4	5.4	1.19 less	16	10
2	Std.	1A55	4.0	6.0		0	0
	Adj.	1A55	3.5/4.5	6.0	1.08 less	12	12
3	Std.	1B75	5.8	8.6		0	0
	Adj.	1B75	5.0/6.2	8.6	1.39 more	6	16
5	Std.	1BP75	6.2	9.4		0	0
	*Adj.	1BP75	5.8/7	9.4	1.55 more	8	10
7½	Std.	2B75	5.4	8.0		0	0
	**Adj.	2B75	4.7/5.9	8.0	2.04 more	15	8
10	Std.	2BP75	7.4	11.0		0	0
	*Adj.	2BP75	5.8/7	9.4	2.60 more	8	10

Average cost premium $0.58 for adjustable pitch drives.

*Based on minimum PD of 6.3 **Based on minimum PD of 5.3

HOW MUCH LIGHT DO WE REALLY NEED TO SEE QUICKLY AND EFFICIENTLY? ***You can determine this in your own plant, using demonstration equipment available from major lamp manufacturers and power companies. These devices allow selection of various levels of illumination while viewing small parts common to your particular operation. When you have selected a lighting level that provides easy seeing, measure the intensity. Don't be surprised if these tests indicate five to ten times the illumination level you are currently using.***

Quantity and Quality

KEY DESIGN FACTORS FOR MODERN INDUSTRIAL LIGHTING

EXTENSIVE TESTING WITH A WIDE RANGE OF PEOPLE ***has shown higher illumination levels are consistently chosen when ease of seeing is the only criterion. Intensive research, conducted in colleges and universities around the world, confirms these findings and has caused sharp upward revisions in recommended footcandle levels in America, England, Brazil, Denmark, Japan and Poland.***

You can obtain a copy of the recently released, 16 page, publication "Recommended Levels of Illumination" by writing to the Illuminating Engineering Society, 1860 Broadway, New York 23, N. Y. enclosing 20 cents for each copy requested. In this publication, detailed minimum recommendations for a wide range of industrial tasks are presented to guide your planning for up-to-date industrial lighting installations.

Fig. 1. Luminous-type ceiling provides 250 fc of diffused light on the work for meter assembly.

THERE IS only one good reason why you should install better lighting in your plant: to secure a profitable return on the investment your company is making in plant facilities, machinery, equipment, inventory and the biggest item of all, the labor payroll.

Lighting is provided for people. It has been said that 87 per cent of intelligent communication is through sight. Smell, touch and sound account for the balance. In a typical day, the eyes are used constantly to read orders and instructions, to set machine dials, operate correct push-buttons, check progress of the work and read meters, verniers, micrometers and other quality control instruments.

Good lighting makes seeing easier for everyone. It can increase productivity, decrease rejects, result in less eyestrain and improve morale. In addition, more experienced older workers can maintain high productivity even though visual acuity may be declining.

Economically, modern industrial lighting may prove to be an attractive investment. In a typical case, saving just six minutes per worker in an eight hour day pays for 200 fc of comfortable lighting. In an office area, 100 fc costs about the same as the value of the time taken up by a ten minute coffee break.

There are two factors to be considered in lighting design. One of these is "quantity." It is important to have a lighting level that will provide easy seeing. The second factor, "quality," is frequently overlooked in typical industrial areas. Lighting must promote easy seeing without excessive glare or brightness differences that interfere with visual comfort.

Considering just "quantity" of

By **MORGAN CHRISTENSEN**, Product Planning and Application
General Electric Company, Nela Park, Cleveland, Ohio

QUANTITY AND QUALITY

light required, illumination levels should be keyed to the tasks performed in the area. Fifty footcandles is the amount most of us should have to read this magazine page comfortably. To maintain this level of seeing, six times that amount or 300 fc would be required for the medium grade assembly tasks. Seventy times this amount, or 3500 fc, would be needed in precision diemaking to maintain the same level of vision used in reading this magazine.

Obviously it is not practical to supply 3500 fc of lighting in an entire diemaking area, but an understanding of these visual ratios will point out the relatively low visibility we provide for some of our highest paid employees.

To provide "quality" in a lighting system, we must do three things. Fixtures must be well shielded to prevent direct, uncontrolled glare. Louvers and center V's that shield lamps down to 35 degrees below horizontal are usually adequate.

Secondly, fixtures with 25 to 40 per cent uplight can significantly improve the "quality" of lighting in an area. Uplight relieves brightness contrasts between the bright fixture and the relatively dark ceiling.

The final items for a completely comfortable visual environment are light colored walls, floors and ceilings. These reflecting surfaces are part of the lighting system and lighter colors make rooms feel larger and more comfortable. Machinery and floors should also be finished in light colors to provide a visually comfortable task-to-background brightness contrast.

When we combine "quantity" and "quality" in our lighting designs we have improved the probability of efficient utilization of profit producing men and machines. In the following typical examples of modern industrial lighting, note particularly the application of both "quantity" and "quality" to create comfortable working areas.

Complex meter assembly at the Hickok Electrical Instrument Company, Cleveland, Ohio, is performed under a luminous-type ceiling which provides 250 fc of well diffused light on the work, Fig. 1. The low brightness ceiling provides good visibility, particularly when working with shiny instrument parts. The room is air conditioned and kept under positive air pressure to prevent dust infiltration. Light walls and benches contribute to the comfortable surrounding.

Another example of critical visual work is the meter assembly area in the Assembly Products plant, Chesterland, Ohio, Fig. 2. In this application, rows of eight foot fixtures are mounted 7 ft, 6 in. above the floor on 7-ft centers to provide 250 fc. Note workers are oriented to look at the long axis of the fixtures. The deep center V effectively shields the lamps to prevent glare. This system would require louvers if workers were seated to view the fixtures along their length.

Three separate lighting systems are combined to provide 600 fc on the work in the coil winding operation at DeLuxe Coils, Inc., Wabash, Indiana, Fig. 3. About 200 fc each is provided by the general lighting system, the supplementary lighting system mounted over the tables and by the illuminated magnifiers.

Fixtures are tipped 20 degrees in a new installation at Charmeuse Hosiery, Asheville, North Carolina, to

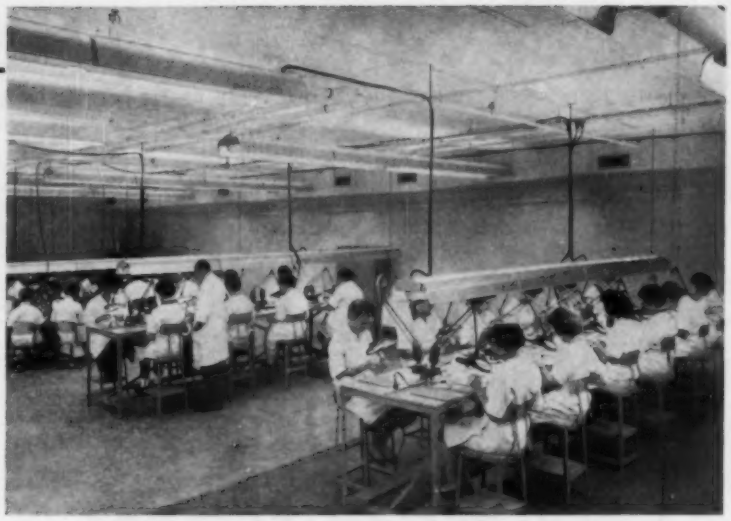


Fig. 3. Three separate lighting systems provide 600 fc for this coil winding operation. About 200 fc is supplied by each system.

Fig. 2. Fixtures provide 250 fc for assembly operation. Center V's in fixtures shield lamps, reducing glare.

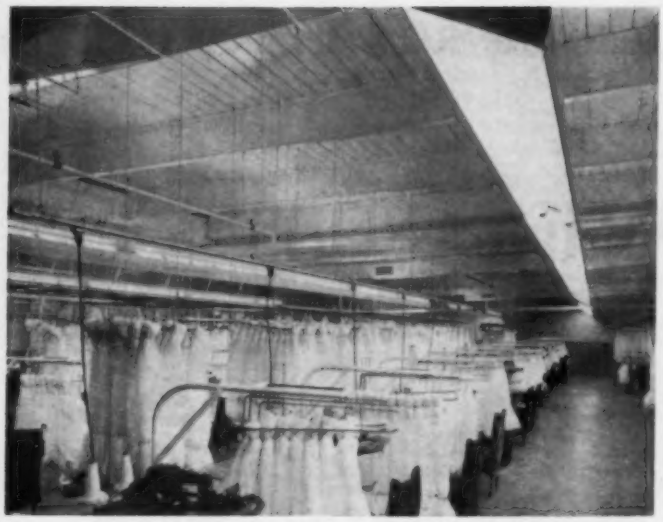


Fig. 4. Fixtures are tipped 20 degrees to throw a flood of light over workers' shoulders into the knitting machines.

Fig. 5. In this composing room, 14 rows of eight-foot lamps mounted above a plastic louver provide 300 fc.

throw a flood of light over the workers' shoulders into the hosiery knitting machines, Fig. 4. Mounted eight feet above the floor, the system provides 200 fc. Average daily output per worker is now claimed to be 24 dozen pairs, which is four dozen pairs above the daily output of the best workers under the older lighting system.

In the composing room at Uarco, Cleveland, Ohio, 14 rows of eight foot lamps provide 300 fc, Fig. 5. Lamps are mounted on two-foot centers, one foot above the plastic eggcrate louver. Finished ceiling height is 12½-ft in this 35-ft by 38-ft area. Previous system produced around 40 fc, requiring the use of supplementary lighting over the composing tables.

Adapting techniques applied to lighting demonstration equipment, some inspection booths at B. F. Goodrich Company, Akron, Ohio provide up to 1000 fc for inspection of hydraulic brake cylinder cups, Fig. 6. Eight, 96 in. 1500 ma, cool white lamps are positioned above adjustable louvers to permit operator control of lighting level.

Four continuous rows of fixtures on 12-ft spacing, were mounted 13 ft, 6 in. above the floor at the General Iron & Metal Corporation, Chicago, Illinois, to produce 200 fc, Fig. 7. This installation was made to speed up production and reduce complaints on poorly sorted scrap. Sorting is easier under the new lighting because of the color discrimination necessary to sort out various percentages of copper in brass. **End**

Fig. 6. Inspection booths provide up to 1000 fc for inspection of small molded rubber products. Eight, 96 in., 1500 ma lamps are installed in the housing.

Fig. 7. Four continuous rows of fixtures on 12-ft spacing were mounted 13 ft, 6 in. above the floor, to provide 200 fc in scrap metal sorting area.

CONSTRUCTION SPECIFICATIONS

By R. E. WALLIN, Chief Engineer, Construction, Plant Engineering Dept., Joseph T. Ryerson & Son, Inc.

CARPENTRY — MILLWORK HARDWARE

SCOPE. Under this subtitle, the architect generally outlines the work included. To illustrate, the specifications might read: Carpentry, millwork, and hardware hereunder shall include the following work for the plant building—wood cant strips for roof, wood man doors, and plywood winter closures for wall louvers; and the following work for the office building—wood windows and door frames, storm vestibule enclosure, wood cant strips and members for roof curb, wood joists, plywood blocking and nailers, wood cabinets in conference room and in recreation room, wood doors and air relief grilles, wood handrails for stairs, and all hardware, caulking, steel sash, and pressed steel frames. All finished wood parts shall be of first-quality millwork and made of seasoned and dry materials.

WOOD WINDOWS. Wood windows should be installed complete with sills and trim. Sash is generally specified as made of clear Idaho white pine. The parts of the frames and the inside trim around the frames can then be made of clear Ponderosa pine. Stools can be made of white birch or of marble.

All wood members, except interior trim, must be treated on all surfaces (front and back) with a wood preservative in two full coats. Trimmed edges of fitted sash should be treated after fitting.

Sash must always be accurately fitted and adjusted and all hardware properly installed.

DOOR FRAME AND STORM VESTIBULE. In our typical building, we ask the contractor to provide a wood frame and door for a doorway in one of the outside walls and a storm vestibule outside of this doorway, as detailed. The frame and door to be made of clear Ponderosa pine and treated with a preservative. The frame to be securely fastened in place using concealed wood jamb blocks.

The door in the storm vestibule to be a stock design, 1⅛-in. thick combination storm and screen door, having two horizontal lower panels. Screening to be of aluminum wire.

All rough and structural framing of the vestibule was specified as No. 1 fir. Posts to be selected structural grade Douglas fir. Windows to be Idaho white pine and all trim to be of Ponderosa pine treated with two "applied at the mill" coats of preservative, retouched after trimming for fitting.

All the work must be accurately fitted and properly equipped with rough and finish hardware.

WOOD PLATES—NAILERS. Contractor should be asked to furnish and install continuous nailers, generally of No. 1 fir of sizes shown on the drawings and treated with two coats of wood preservative, as specified for wood frames.

CANT STRIPS. Continuous wood strips to form roofing cants as shown on plans should be provided to form slanting surfaces for turning up roofing onto vertical walls.

These strips are often made of halves of No. 1 fir timber, ripped on the diagonal line of the section, treated with two coats of preservative before installation. Architects also specify cants made of insulation material and of poured and formed lightweight aggregate concrete.

WOOD DOORS. In our typical building, wood doors were provided for all door openings where shown on

Fig. 1. Carpentry in industrial plants takes many forms; here, workman lays plywood floor plates over metal joints.

the drawings (except the outer doors in the front entrance, doors in metal partitions and toilet room compartments, and any other doors which are to be of metal and supplied under other branches of the work).

The doors must be first-quality millwork, without warp, and each accurately fitted into their respective frames.

MIRRORS. On a small job such as the one we discuss herein, it is often customary for the carpenter-contractor to provide and install mirrors and stainless steel shelves over the lavatories, "slip" mirrors in office washrooms, makeup mirrors and mirrors in plant washrooms, all as shown on plans.

The mirrors should be polished mirror quality plate glass. The backs to be covered with a heavy coat of electro-plated copper over a film of silver. This surface should then be given a coat of pure shellac, followed by an application of special mirror-backing paint. Edges must be painted black. Good frames can be made of plain pattern, satin finished stainless steel, with Masonite backs, fastened to walls with approved clips.

CAULKING. "Caulking," under carpentry generally, is meant to include joints between door, window, and other frames, and exterior masonry and wherever is it required as part of this contractor's work.

Caulking does not include any caulking between parts of any trade where caulking is specifically covered under such other trade's heading.

The jambs, heads, and sills of door frames and window frames must be neatly and tightly caulked with caulking compound, applied with a pressure gun where they meet masonry and/or stone to completely fill the cracks and to make an even, continuous fillet with a slightly concave surface.

Frames and masonry must be cleaned, dusted, and dry before caulking is applied. Any excess caulking materials on faces of frame members or masonry are to be removed.

CASES. In our typical building there are stationery cases in the office conference room and in certain storerooms. These cases to be mill-made of first-quality, as detailed on the plans and installed with complete hardware.

There were also cabinets in the recreation room kitchen recess. These were called for as of stock manufacture, selected by the owner, and installed with a stainless steel facing sheet over uncovered wall areas between cabinets, all as shown on the plans.

HANDRAILS. The handrails in the stairways are best when made of laminated birch as detailed on the plans. Brackets are generally furnished by the miscellaneous iron contractor as part of his stair and railing requirements.

HARDWARE. All rough and finish hardware for wood doors, windows, and other wood parts are to be furnished and installed under this branch of the work.

Hardware and its installation for stainless steel doors, doors in metal partitions, gates in railings, and doors in toilet compartments are furnished and installed under these other branches of work.

As a rule, finish hardware, such as locksets, latchsets, butts, door closers, push plates, pulls, door bumpers, sash lifts, sash locks, stop screws, and washers are selected by the architect and/or the owner. It is customary to ask the contractor to set up a fixed lump sum price for the purchase of this finish hardware, with the provision that should that selected cost more or less than the stipulated amount, the difference in cost will be adjusted up or down as required.

Stainless steel kickplates and oval head screws for same, painted black steel guard plates with screws for same, and other hardware, such as bolts, nails, spikes, sash balances, weather stripping, thresholds, mirrors, shelves, paperholders, etc., are to be furnished, installed, and paid for by the contractor as part of his contract.

It is most important that all hardware be neatly and

Fig. 3, above. Exterior construction work, such as this roofing job on bowstring trusses, calls for carpentry skill.

Fig. 2, left. Interior work for carpenters is shown in this photo of furring strips and insulation in computer room.

securely installed and accurately fitted. Trim members should not be installed until after painting and other finishing is completed.

STEEL SASH. In our typical building, this contractor is to furnish and install any required steel sash; on other jobs it may be some other contractor.

PRESSED STEEL FRAMES. Metal frames are generally also furnished by this contractor. Good frames are made of No. 16 gage sheet metal, formed to specified detail, with frame, casing, and stop members formed in one piece. Jamb sill and head joint openings should be mitered and welded and ground smooth on exposed sides.

It is important that door frames be provided with standard adjustable anchors, not less than three on each jamb, and with removable bottom spreaders,

Metal window sash should be provided with removable, formed, steel, glazing stops, held to the framing with oval head countersunk brass screws.

Door frames and doors should be provided with cutouts and reinforcements for butts, strikes, closers, etc., to suit hardware templates provided by the hardware dealer.

Frames must be accurately set, in line and plumb, and held well braced until built in.

CONCRETE FORMWORK. Formwork for concrete construction has been covered earlier under the heading "Concrete Work."This work as a rule is done by carpenters who are on the "Concrete Work" contractor's payroll and not on the carpenter-contractor's payroll.

STAINLESS STEEL DOORS AND FRAME

For main entrance doorways, there are many kinds of materials and construction, such as wood, painted steel, bronze, aluminum, stainless steel, and all glass; constructed solid, of cast or formed shapes; and cladding over cores of one kind or another. We prefer stainless for a long life, low maintenance cost job.

SCOPE. For our typical building we would outline under this heading that the stainless steel doors and frame for same are for the front entrance and that work is to be done as detailed on the drawings and as specified in the following sections.

MATERIALS. Generally, the exposed finished portions of both the frame and doors are of No. 302, satin finish, stainless steel, formed to the required shapes detailed on the drawings. For formed members, it is a good idea to use No. 14 gage for doors and No. 16 gage for jambs, heads, and transom bar sills. Flat casing members should be of solid, stainless flats. Glass stops for doors are sometimes milled to profiles rather than specified as square or flat bars.

The hidden subframe members which give strength to the assembly should be of hot-rolled structural steel

Fig. 4. Author's "typical building" features stainless steel entry doors. Materials, workmanship need specification.

shapes and must have protection of a shop coat of red lead paint, retouched as needed during construction and before the finish members are installed to cover it.

All hardware for the doors is to be furnished and installed under this branch of the work. This includes floor hinges, grooved threshold, intermediate pivots, dead locks, top and bottom bolts, pull bars and push bars of approved design, all in stainless steel.

Meeting stiles of doors should have adjustable astragals, chrome-plated.

Glass stops, moldings, and casings should be attached with oval head, countersunk stainless steel screws. Glass generally is installed under the heading "Glazing."

SHOP DETAILS. Contractor should always be asked to prepare complete shop drawings and submit them for approval before starting any fabrication.

WORKMANSHIP. It is important that all members be accurately made, tightly fitted, and securely fastened. Care must be taken so that stainless steel is not scratched or otherwise marred and temporary paper or cloth masking should be applied and maintained until the building is completed. All shims, fillers, screws, bolts, etc., as required for complete shop fabrication and installation must be included.

INSTALLATION. The frames and threshoids must be securely anchored in place, using bolts and expansion shells for masonry and bolts in steel. **End, Part IV**

In the next phase of the specifications series, the author details the writing of construction specifications for general sheet metal work, roofing and insulation.

AIPE Installs New Officers

Retiring president Fryberger, center, presents gavel to incoming president Austin. Other new officers, l to r: Joe Jacques, John Lockhart, Chester Burns.

ANOTHER MILESTONE in the history of the American Institute of Plant Engineers was passed on June 12, in Boston, Massachusetts. At a dinner held on the MIT campus, Gerald W. Austin, of Gulf Atlantic Warehouse Company, Houston, Texas, was installed as the seventh president of the Institute. Presenting the gavel emblematic of the office was retiring president Fred G. Fryberger, Food Machinery and Chemical Corp., Baltimore, Maryland. Hosts at the dinner were the several chapters of the Institute's Region 8.

Vice president of the Institute for the 1961-62 year is Joseph Jacques, Lakeside Laboratories, Milwaukee, Wisconsin; secretary for the coming year will be John E. Lockhart, General Electric Co., Cincinnati, Ohio; the new treasurer Chester E. Burns, A. B. Dick Co., Niles, Illinois.

Recognizing the service of one of the long-time members of the "official family," the Institute presented retiring treasurer Leo J. Monty, Artisan Metal Products, Waltham, Mass., with an engraved desk set.

PLANT ENGINEERING was represented at the dinner by Construction Editor Andy Anderson, who presented retiring president Fred Fryberger with a gavel in recognition of his service to AIPE. This is an annual presentation by our magazine. **End**

Seventy-five plant engineers and guests gathered at Boston's MIT Faculty Club to attend Installation dinner.

Fred Fryberger, retiring AIPE president, right, receives souvenir gavel presented by Andy Anderson.

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Circle 569 on postcard, page 33

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Detailed engineering and application data are included in our handbook No. PSG-559. Write Unit Substation Department, Pennsylvania Transformer Division, McGraw-Edison Company, Canonsburg, Pa.

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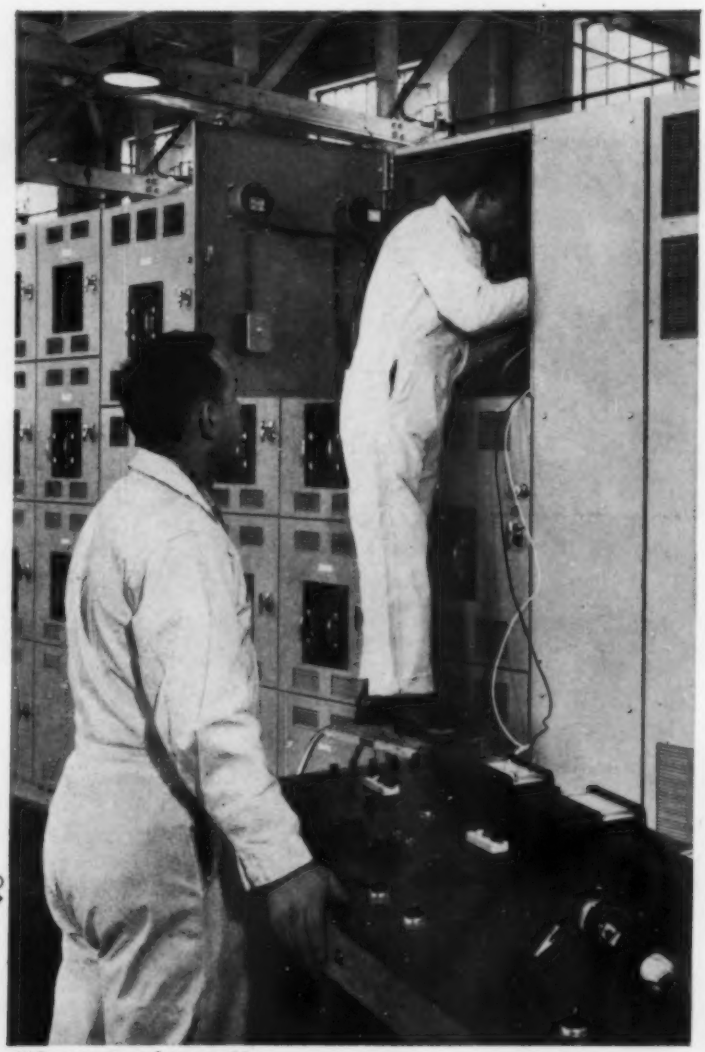

Circle 665 on postcard, page 33

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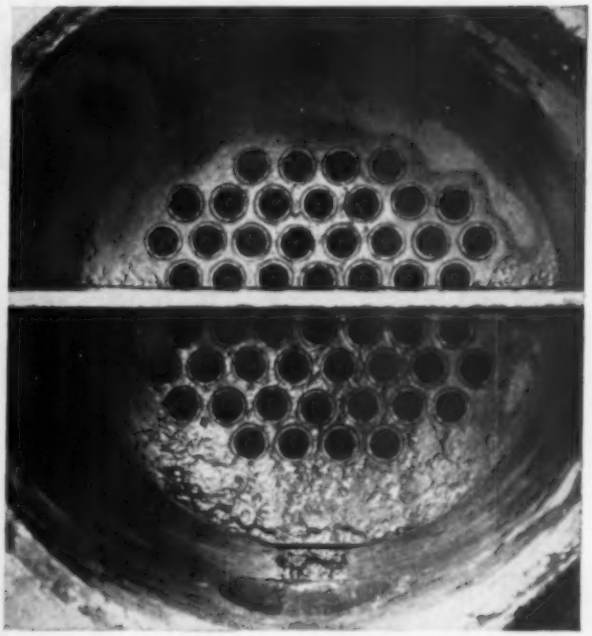

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Circle 570 on postcard, page 33

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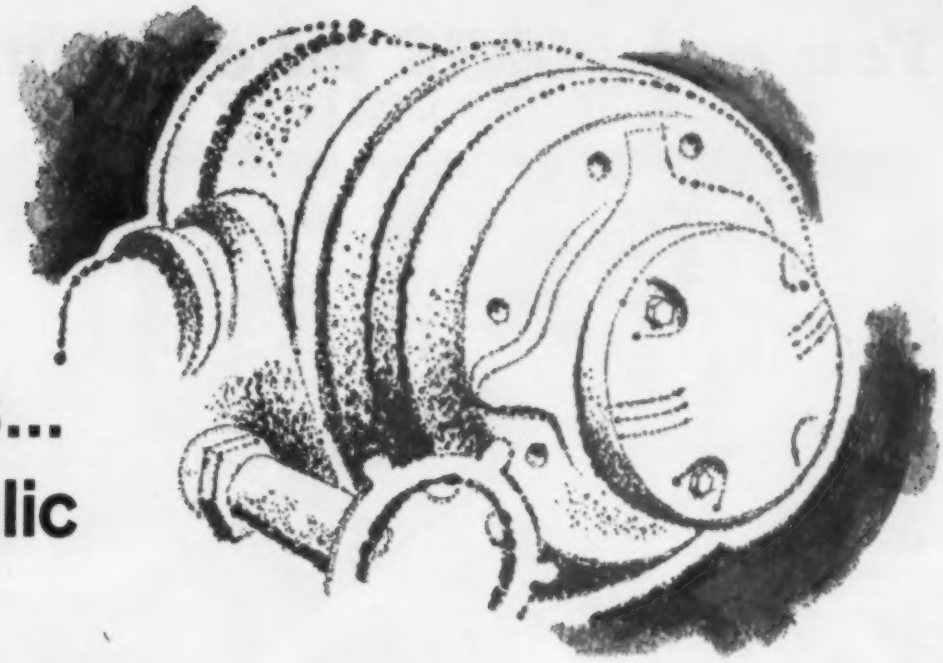

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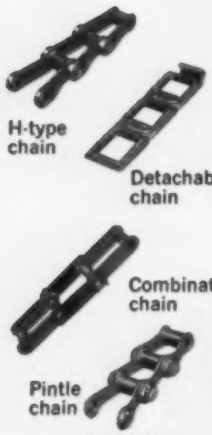

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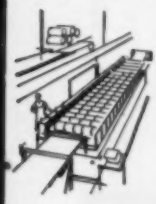


FACTORY FABRICATION. Automatic welding, shearing and gang punching are done to precise specifications—under rigid quality control. The result is a beautiful building . . . an end product that is better in every detail.

TENACIOUS FASTENERS. Experts agree, there is no such thing as a quality metal building *without* quality fasteners to keep it weathertight. That's why Butler uses costly, self-clinching rivets—machine driven to grip with 1,400 lbs. pressure.

INTEGRAL ALUMINUM SASH in all three wall systems. The smooth, satiny look of maintenance-free aluminum. The smooth fit of factory-fabricated components. There's no sloppy field-cut, field-installed flashing.

SPEEDY CONSTRUCTION. Erection is so simple, Butler buildings go up weeks, even months faster. You're in your new building sooner, doing business sooner. You save time and construction cost, without sacrificing quality.

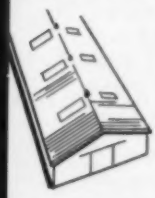
BUTLERIB® WALL PANEL. The finest single-ply wall covering made—so outstanding it is used in Butler's 20-year guaranteed roofs. It is factory color-finished outside and inside. It can be field insulated.

NEW TRIM. New gable and eave trim gives Butler buildings a crisp, finished look—beautiful contemporary lines. This new trim has a pleasing, two-tone finish that harmonizes with any color, any collateral material.

MORE OF YOUR WANTS, NEEDS, LIKES. There are 6 structural systems, 7 design loads, 4 bay lengths, 6 sidewall heights. You get the size building you want. And you get the type of building you want. No compromises.

BUTLER MONOPANL.® A beautiful, three-ply, factory-finished, factory-insulated wall panel. Outside, bold, vertical fluting imparts strong shadow lines. Inside surface is smooth. No visible exterior fasteners. No caulking ever.

NEW BUTLER-TONE™ COLOR. Doubly desirable because it protects as it beautifies. Flat metal is galvanized, cleaned, then given a bonderizing treatment, then roll coated with a thermo setting plastic finish. 8 outside colors. Off-white inside.



TWENTY-YEAR ROOF GUARANTEE. You can have a preferred aluminum roof of such job tested superiority that Butler is now able to offer a 20-year guarantee. You're under no maintenance obligation. This guarantee is a Butler exclusive.

BUTLER MODULAR WALL. The ultimate in wall systems, yet the lowest-cost material in its field. A four-ply "sandwich" prefinished outside and in, factory insulated, too. Built-in doors and windows. Erection is simple and fast. The appearance—elegant.

FINANCING. Your Butler Builder will be glad to help you arrange financing. Ask him about the Butler Building finance plan.

Do you have any other questions? Phone your Butler Builder for the full story. He's listed in the Yellow Pages under "Buildings" or "Steel Buildings." Or write direct.

CELEBRATING 60 YEARS — BUTLER — FABRICATING METALS

BUTLER MANUFACTURING COMPANY

7529 EAST 13TH STREET, KANSAS CITY 26, MISSOURI

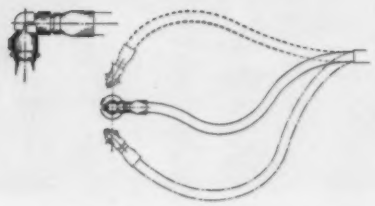
Manufacturers of Metal Buildings • Plastic Panels • Equipment for Farming, Transportation, Bulk Storage, Outdoor Advertising • Contract Manufacturing

Sales Offices in Los Angeles and Richmond, Calif. • Houston, Tex. • Birmingham, Ala. • Kansas City, Mo. • Minneapolis, Minn. • Chicago, Ill. Detroit, Mich. • Cleveland, Ohio • New York City and Syracuse, N. Y. • Washington, D. C. • Burlington, Ontario, Canada

Circle 574 on postcard, page 33

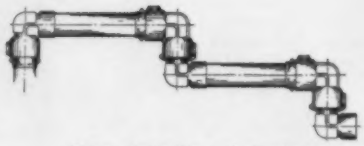
HERE ARE 3 COMMON LINE DESIGN PROBLEMS CHIKSAN SWIVEL JOINTS CAN HELP YOU SOLVE

1 **Shorten hose radii, reduce torsional stress.**



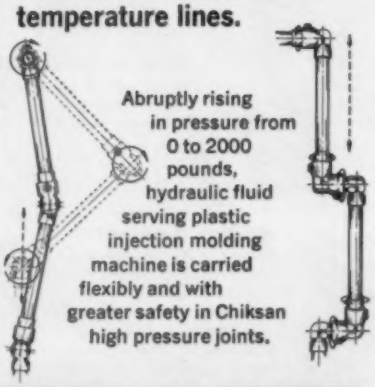
Flexible head on this lens grinder is hydraulically powered. Joints shorten required hose lengths. Hose would otherwise need suspension to keep out of way.

2 **Predetermined flex of piping between two or more points.**

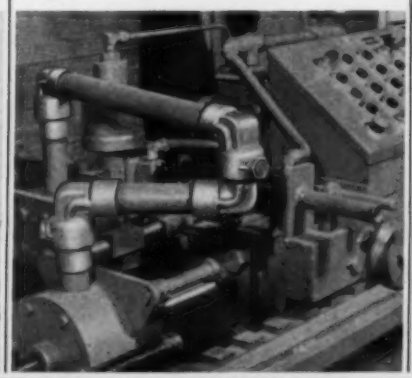


Pressure testing of pipe is nearly automatic as hydraulically driven supply heads close on pipe ends. Dog-leg jointed pipe moves back and forth continuously, safely.

3 **Achieve maximum safety of flexible high pressure, temperature lines.**



Abruptly rising in pressure from 0 to 2000 pounds, hydraulic fluid serving plastic injection molding machine is carried flexibly and with greater safety in Chiksan high pressure joints.



Studied consideration will quickly show that Chiksan swivel joints have numerous applications. Whenever you have a piping situation where movement is required, the benefits of swivel joints should be weighed. As illustrated above, Chiksan swivel joints have great versatility. They give added life and adaptability to rubber hose. They give metal lines a rubber-like flexibility. They help relieve stresses imposed by expansion, vibration or misalignment. Chiksan swivel joints, with their full 360° rotation and high service life, quickly pay for themselves by minimizing hose failures, eliminating costly line failures, fluid loss and downtime. Chiksan swivel joints have a wide range of pressure and temperature ratings to meet most industrial applications. There is a nearby experienced representative who will call, analyze your requirement and make specific recommendations. Write today for his name.

#61-64

fmc CHIKSAN COMPANY • 330 NORTH BREA BLVD., BREA, CALIFORNIA

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

Please send me a copy of your catalog and the name of your nearest representative.

Name_____ Company_____

Title_____ Address_____

City_____ Zone_____ State_____

CHIKSAN COMPANY—General Offices: Brea, California • Well Equipment Mfg. Corp. Division (Weco Unions, Homer Valves) • Chiksan International • Chiksan of Canada Ltd. Offices and Representatives in Principal Cities of the World

Circle 575 on postcard, page 33

ADVANCED FERRO-PHOBIA

No Couch Can cure it, but ***Dings'*** *ll do it.*

. . . Fer'ro-pho'bia. Fear of iron. It's enough to send cost-conscious "Supers" into a sweat and Treasurers into a trauma.

Head shrinking may tranquilize the symptoms but does little to remedy costly repairs, production delays and ruined product caused by tramp iron in the "works."

Dings has the Rx for tramp iron psychosis —of *all* types. There's a Dings electric or non/electric unit for installation in, on or above *any* processing or materials handling system. And there are Dings units which can save you money and time in: product purification, metallic reclamation and the beneficiation and concentration of a wide range of substances.

See your Dings man, or write for Bulletin C-5000-B.

Dings

DINGS MAGNETIC SEPARATOR COMPANY

4766 West Electric Avenue, Milwaukee 46, Wis.

MAGNETIC SEPARATION

Stop tramp iron damage before it costs you money

LET DINGS DO IT.

Here's just one way—Dings magnetic pulleys, electro or permanent, are at work pulling unwanted iron out of everything from grain to cotton . . . to chemicals and molybdenum ore.

For over sixty years—Industry's Specialists for magnetic: separation . . . concentration . . . materials handling

Circle 576 on postcard, page 33

PE-261

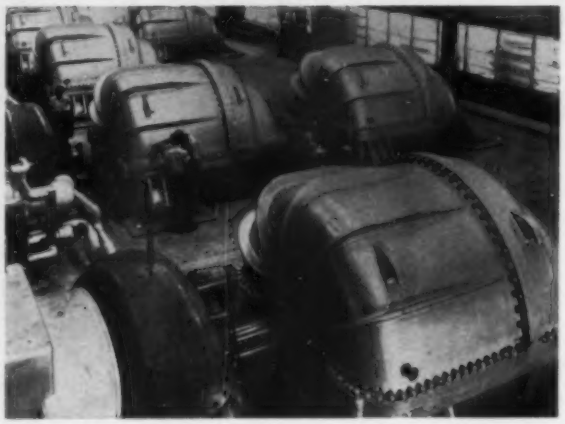
Six 100,000-CFM Centrifugal Compressors Team Up To Simulate Flight Conditions

FORMING ONE of the largest centrifugal compressor installations in the aircraft industry are six units in the West Palm Beach, Fla. research and development center of Pratt & Whitney Aircraft, Division of United Aircraft Corporation.

The compressors, furnished by Allis-Chalmers and rated 100,000 cfm at 3.7 pressure ratio, may operate as compressors or exhausters. They are being used as compressors to ram air through the engine intake to simulate aircraft flight speed and as exhausters to evacuate engine exhaust gases to simulate altitude conditions in the high altitude and high Mach number test facility.

The six-compressor system includes two arrangements of two compressors in tandem, each tandem arrangement powered by its own turbine drive. When acting as compressors, the outboard units of these pairs are disconnected by a disconnect coupling and the remaining units will work in parallel up to the full 13,500 hp of each turbine drive. As exhausters, the outboard machines are reconnected and all six can then work either in parallel or in series to obtain the necessary volume and pressure ratio requirements for a particular test.

One of the major projects carried on at the Florida research and development center is the development of a turbojet engine, the J-58, the most powerful turbojet engine being developed in the free world. It is designed for Mach 3 performance and rated in the 30,000-lb. thrust class.



In addition to testing full scale engines, this facility, which also includes an Allis-Chalmers V-502 compressor, is used to test various engine components for design and development purposes.

Nuclear Research Facility Gets Biggest Computer System To Solve Its Problems

MOST POWERFUL computer in the world, the IBM STRETCH system is being installed in one of the nation's key nuclear research centers—Los Alamos Scientific Laboratory in New Mexico. At Los Alamos, the system will work on complex and critical projects in research and development in nuclear and thermonuclear energy.

The computer, the most versatile data processing system ever built, was designed and constructed over a five-year period at IBM's laboratories in Poughkeepsie, N. Y.

STRETCH can perform more than thirty billion multiplications during a twenty-four hour period. Working with fourteen-digit numbers (figures in the trillions), the system can make an addition in 1.5 microseconds; a multiplication in 2.7 microseconds; a division in about 10 microseconds. This speed makes possible solutions to problems for which equations are known, but which previously were too large or complex for solution for a reasonable cost or in a reasonable length of time.

STRETCH technology attains its high speeds through the use of ultra-fast circuits, transistors and circuit components. But it is the principle of simultaneous operation that provides the really large increase in performance over previous systems.

The powerful computer is organized like an assembly line; each part completes a task, it passes the work on to another machine element and immediately starts its next task, while the other parts continue with theirs. As a result, the main arithmetic unit is free for almost continuous programming.

The system has been equipped with a new large-capacity magnetic disk storage file to supplement internal core storage, should the need arise.

This unit will store 2,097,152 words, each comprising sixty-four information bits. The equivalent of 1,200,000 digits of information can be transferred from the file to core storage units, or back, in one second. It would take less than a half-minute to read the entire disk file's capacity to or from core storage.

A new approach is employed in the operator's console, which is logically separated from the main computer and functions as an input-output device. The keyboard, switches, lights, digital display and console printer all are subject to programmed interpretation and control.

A specialized computer within the system, called the Exchange, acts as a switching center, routing information between the internal core storage of the system and eight channels—each able to handle up to eight tape units, a card reader, a card punch, console or printer. The Exchange is capable of controlling the flow of 800,000 characters a second from the input-output equipment.

The computer incorporates more self-checking features than any other computer—all data transfers and calculations are checked for accuracy and many errors are corrected automatically.

More News from the Plants on page 145

KNOW YOUR SYMBOLS

This symbol stands for bus duct

This symbol stands for QUALITY

XL Bus Duct by BullDog

Assures maximum plug-in safety—cuts costly power loss!

XL BUStribution® Duct by BullDog puts plants ahead in both protection and power distribution efficiency . . . a fact proved daily in hundreds of today's most modern industrial facilities.

Safest to plug in! XL Duct and Plugs are designed to work the safe way *only!* Plug hooks easily onto duct, freeing the worker's hands to complete electrical plug-in. Foolproof dead-front safety is assured by Butyl insulation that encloses the entire length of each aluminum bus bar. Plug-in doors *can't* close on live contacts. And plugs *can't* be inserted or removed when in the "ON" position. Result—maximum protection for people, property *and production!*

Cuts power loss! XL Duct delivers power more efficiently than any other duct for two reasons: (1) low heat loss; (2) proximity of bus bars that minimizes voltage drop, cuts current loss down to as little as *half* that of other duct systems.

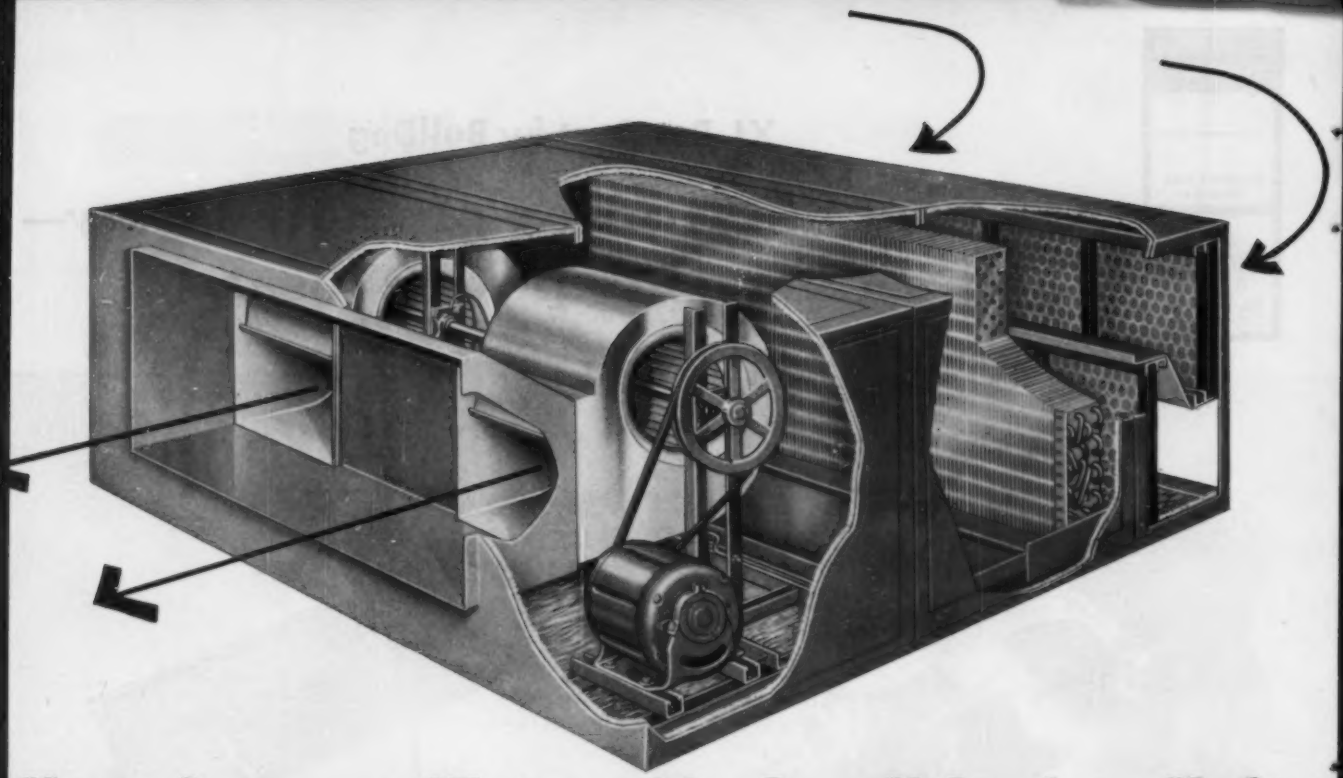
XL Duct is also four ways easier to install. For detailed information about XL Duct or BullDog BD plug-in duct, LO-X® plug-in duct and LO-X feeder duct, call the nearby field representative or write:

BullDog Electric Products Division, I-T-E Circuit Breaker Company, Box 177, Detroit 32, Mich. In Canada: 80 Clayson Rd., Toronto, Ont. Export Division: 13 East 40th St., New York 16, N.Y.

I-T-E CIRCUIT BREAKER COMPANY

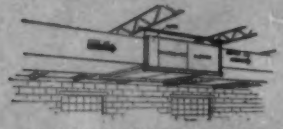
BULLDOG ELECTRIC PRODUCTS DIVISION

Circle 577 on postcard, page 33



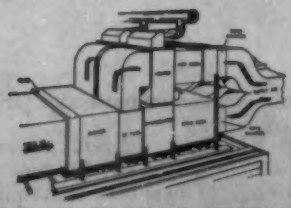
New Lennox 17-ton Air Conditioning Unit

EASILY ADAPTS TO WARM AIR HEATING
...room in cabinet for hot water or steam coils

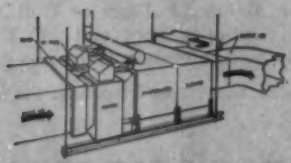


COOLING SYSTEM ONLY
(or with wet heat coil added)

ANOTHER COOLING APPLICATION



COOLING, VENTILATING, HEATING WITH DIRECT-FIRED HEATER
(multi-zone)



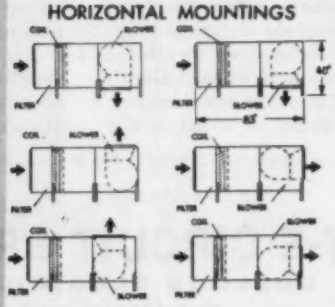
COOLING, VENTILATING, HEATING WITH DIRECT-FIRED HEATER
(single-zone)

A "jillion" possibilities for up-flow, down-flow or horizontal application

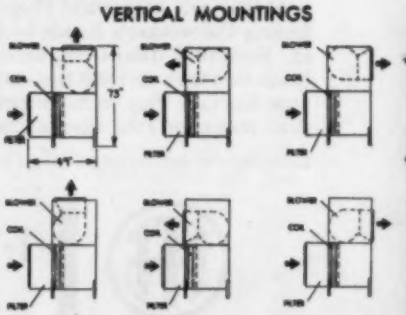
You've asked for it and here it is! Never before has so much cooling been put in such a compact package. And, a unique dual refrigerant circuit gives you latent capacity control without using expensive by-pass ducts or complicated control systems. A simple two-stage controller does the job, providing modulated temperature and humidity control. The ample face area of the coil reduces total resistance in the system. Result: lower BHP.

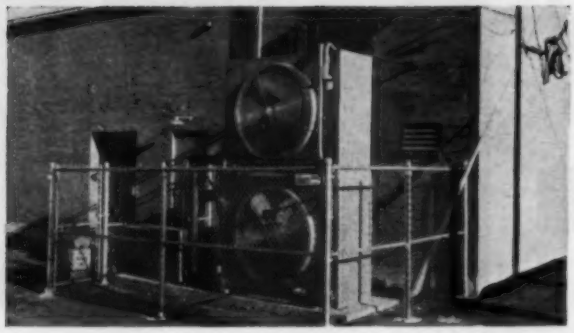
The unit consists of three sections: evaporator, blower, and filter. They are easily assembled for horizontal, up or down air delivery. Motor and plumbing are enclosed in the cabinet which is weatherproof and lined with 1-inch fiberglass. Recessed blower outlets permit duct connection without additional transitions. All servicing can be handled from one side. For complete data, write LENNOX, 609 S. 12th Ave., Marshalltown, Iowa.

HORIZONTAL MOUNTINGS



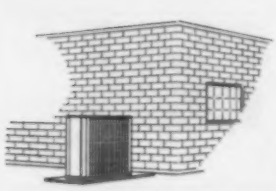
VERTICAL MOUNTINGS



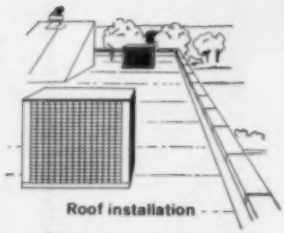


Lennox Air-Cooled Condensing Unit for Commercial and Industrial Use

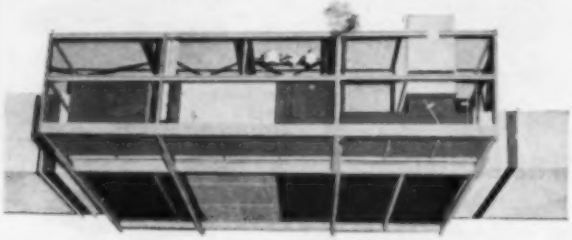
Here's economy, ruggedness and application ease all in one unit. Exclusive circuiting method sub-cools the refrigerant so it reaches the evaporator much cooler than in average units; sub-cooling increases this unit capacity by 10%. Result: over 10 Btuh cooling per watt of total input (85° outdoor air). Straight-through air travel permits "stacking" of units, as in photo above.



Unit at grade level on slab



Roof installation - - -



You can heat, cool or ventilate any existing building with Lennox equipment

The complete line of Lennox equipment, and your Lennox representative will make your designing and buying job easier . . . providing one central source for direct-fired heaters with up to 2,000,000 Btuh capacity, and cooling and ventilating for any job.

Don't be satisfied with less than

LENNOX

Heats • Cools • Treats and Moves Air

IN HOMES IN CHURCHES IN SCHOOLS IN BUSINESS IN INDUSTRY

LENNOX INDUSTRIES INC., FOUNDED 1895 — MARSHALLTOWN AND DES MOINES, IOWA; COLUMBUS, OHIO; SYRACUSE, NEW YORK; DECATUR, GEORGIA; FT. WORTH, TEXAS; SALT LAKE CITY, UTAH; LOS ANGELES, CALIFORNIA. LENNOX INDUSTRIES (CANADA) LTD. — TORONTO, MONTREAL, CALGARY, VANCOUVER, WINNIPEG.

Circle 578 on postcard, page 33

News from the Plants

Mechanized Sorter for Lumber

NOW IN USE in several lumber plants, among them the Kirby Lumber Corp., Silsbee, Texas, an automatic sorter has been developed to simplify lumber sorting.

Called Measurmatic by its inventors, H. E. Bovay Jr., Consulting Engineers, Houston, Texas, the sorter reduces manpower substantially. For example, at one mill, four men are now accomplishing the same amount of lumber sorting and processing as had been done by 16 to 20 men using manual methods.

In operation, a "feeder" man starts each successive board on a conveyor and it is automatically kicked off into a

mechanized accumulation bay, according to its length. All boards are fed from the same point alongside the sorter.

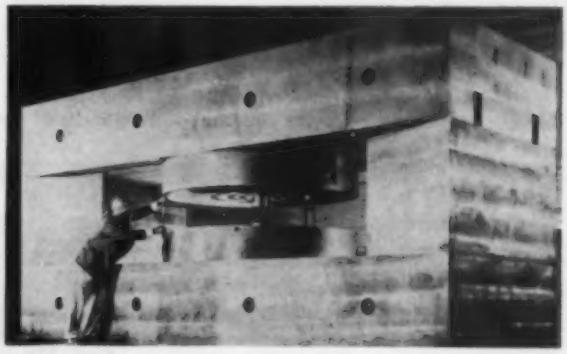
The sorter is designed for high-speed production—600 to 700 feet per minute board travel, and production rates from 100,000 to 250,000 board feet a day.

Multi-Ton Blocks Fit To Thousandths

FOURTEEN massive blocks of precision-machined solid steel have been delivered by U. S. Steel and set in place at the University of California's Lawrence Radiation Laboratory. The 14 pieces, weighing 12 to 21 tons each, make up the magnet core, heart of a new 88-in. cyclotron.

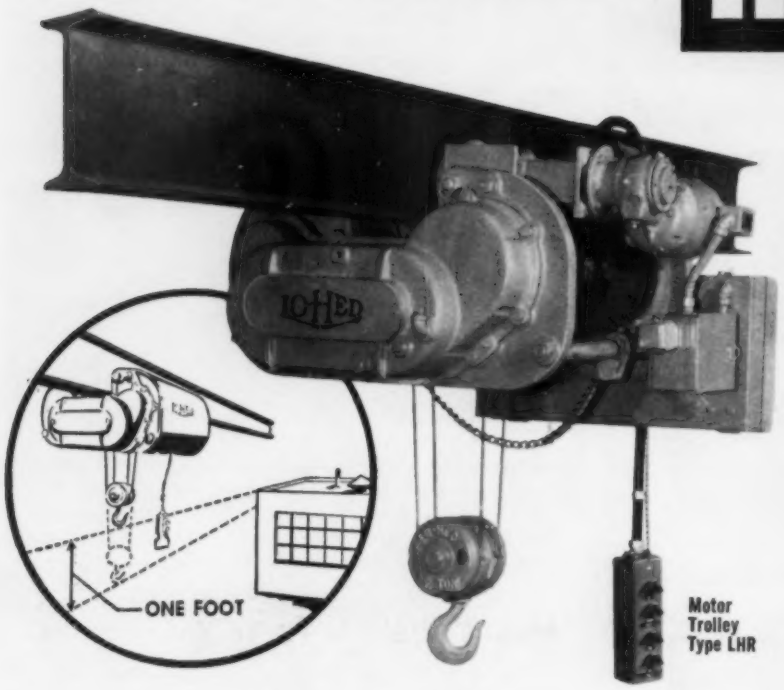
Specifications called for the steel forgings, some of which are 20 ft long, to be machined so carefully that they would fit together with not more than .006-inch gap between them.

At the laboratory the big blocks were reassembled, with pieces held in place by 3½-in. diameter steel bolts. To insure tight fit, a "bolt-stretcher" was devised by University of California engineers. A hollow hydraulic jack was slipped over each bolt to be tightened, and two nuts threaded onto the bolt. The top nut secured the jack, which then applied 350,000 pounds pull on the bolt to stretch it 3/16 of an inch. The second nut was then screwed down, to hold the pieces in position.



LOW HEADROOM MEANS E-X-T-R-A WORKROOM

Æ LO-HED® HOISTS



and no other hoist gives as much workroom as LO-HED.

The extra workroom you get from a LO-HED hoist is like money in the bank. In new building construction you'll realize sizeable savings in a foot or more of construction height. In your present plant you'll have extra workroom for speedier and easier handling of materials. All this is accomplished with LO-HED's exclusive balanced-around-the-I-beam design, which eliminates bulky arrangements that waste horizontal work area.

And that's only half the story. Other LO-HED advantages include precision engineering and rugged construction to cut costly downtime; 100% positive automatic stop; powerful automatic holding brake; a fully enclosed, heavy-duty, ball bearing motor especially built for heavy hoist duty. And most importantly, the longer working life at lower cost makes LO-HED hoists first in long-range economy.

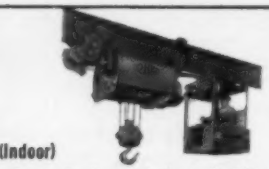
HAVE A HOIST PROBLEM?
Let our engineers analyze your needs and custom plan the proper hoist.

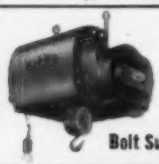
Complete Line of HOISTS and CAR PULLERS for Efficient Materials Handling

Plain Trolley Type

Hand-Geared Trolley Type

Motor Trolley Type S


(Indoor) Motor Trolley, Cab-Controlled Type


Bolt Suspension Type

Stationary Type

Car Puller

AE INDUSTRIAL DIVISION
AIRCRAFT ARMAMENTS, INC. Post Office Box 6853, Baltimore 4, Md.
CLEVELAND DISTRICT: A. E. Company, 1157 Leader Building, Cleveland 14, Ohio
NEW YORK DISTRICT: AE Industrial Division, 1 Exchange Place, Jersey City 2, N. J.

Circle 579 on postcard, page 33

Circle 580 on postcard, page 33 →

"These ILG Ventilators save ceiling replacement"

. . . Ohio Falls, Inc., Louisville, Ky.

"Vapor in our dye plant was so thick *until we standardized on Ilg*," writes W. B. Willingham, president of Ohio Falls, Inc., Louisville, Ky. "It was *like walking through rain*."

"Building maintenance costs were terrific as we were constantly replacing ceilings, sills and flooring. Due to heavy moisture, we cannot use metal ducts . . . have to make them of either cypress or redwood.

"Since installing Ilg ventilators we have had no moisture or steam vapor loose in our plant. Building repair costs are at a minimum. Maintenance costs on Ilg equipment are even less. Fact is, there are *none*."

ILG®

ILG ELECTRIC VENTILATING CO.

2832 N. Pulaski Road, Chicago 41, Ill.
Offices in 60 Principal Cities
Member of Air Moving and Conditioning Association, Inc. (AMCA)

Here's why centrifugal and propeller roof ventilators satisfy so many

Finger Points at patented pressure cooling feature of Ilg L-CRF centrifugal roof ventilators exhausting fumes from research laboratory of The Mead Corporation, Chillicothe, Ohio. Ilg-built backward-curved aluminum airfoil fan wheel with patented backplate fins pulls cool air into motor compartment and through the motor to protect against build-up of heat from sun . . . *increases motor life expectancy up to four times that of ordinary units.* Fifteen sizes for capacities from 155 to 27,290 c.f.m. WRITE FOR CATALOG DB3-200.

Upblast Roof Ventilators with butterfly dampers provide high-speed, vertical exhaust. Airfoil-design propeller blades (in five sizes from 24″ to 48″) are direct-connected to Ilg-built totally enclosed motors. A choice of fourteen capacities from 5060 to 33,300 c.f.m. WRITE FOR CATALOG DB3-300.

Ilg L-LSQ Propeller Roof Ventilators have direct connected, patented "Q" fan wheels that pass air over blade smoothly, quietly. Low starting torque of Ilg 3-phase and permanent-split capacitor; single-phase motors eliminates starting shock, lengthens fan life. Eleven sizes to choose from for capacities from 287 to 21,100 c.f.m. WRITE FOR CATALOG DB3-100.

ILG ELECTRIC VENTILATING CO.

2832 N. Pulaski Road, Chicago 41, Ill.

Offices in 60 Principal Cities

Member of Air Moving and Conditioning Association, Inc. (AMCA)

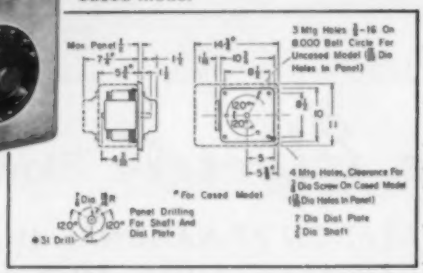
NEW W30 Variac®

CONTINUOUSLY ADJUSTABLE AUTOTRANSFORMERS

Uncased for back-of-panel mounting; cased models for bench or wall mounting.

- Patented Duratrak brush track practically eliminates oxidation and deterioration, provides long life even under adverse environmental and load conditions.
- Excellent thermal coupling between coil and base allows high current rating.
- High-silicon, low-loss core material.
- All models are available as motor-driven assemblies.
- Ball-bearing units at slight extra cost.

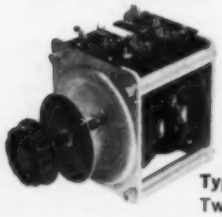
Type W30M
. . . $97.00
Cased Model



Can be connected for output-voltage range from 0 to line voltage or 0 to 17% above line voltage (overvoltage connection).

Type	Input Voltage	Output for Line-Voltage Connection: KVA	Voltage Range	Rated Current	Maximum Current	Output for Overvoltage Connection: Voltage Range	Rated Current	Price
W30	120	4.32	0 to 120	30	36	0 to 140	30	$75.00
W30M*	120	3.84	0 to 120	28	32	0 to 140	28	97.00
W30H	240	3.74	0 to 240	12	15.6	0 to 280	12	75.00
	120	—	—	—	—	0 to 280	6	
W30HM*	240	3.74	0 to 240	12	15.6	0 to 280	12	97.00
	120	—	—	—	—	0 to 280	6	

No-Load Loss: 35 watts at 60 cps with rated input voltage.



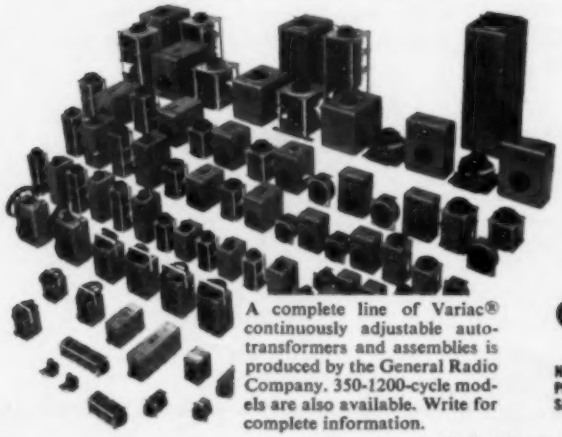
GANGED MODELS

Two- and three-gang assemblies of W30-model Variacs available either cased or uncased.

Type W30G2 . . . $160.00
Two-gang Uncased Model

Type	Connection	Input Voltage	KVA	Voltage Range	Rated Current	Maximum Current	Price
W30G2	Parallel Series	120	8.6	0 to 140	60.0	72.0	$160.00
		240	8.6	0 to 280	30.0	36.0	
W30G2M*	Parallel Series	120	7.7	0 to 140	56.0	64.0	190.00
		240	7.7	0 to 280	28.0	32.0	
W30G3	Parallel 3-Phase Wye	120	13.0	0 to 140	90.0	108.0	240.00
		240	15.0	0 to 240	30.0	36.0	
W30G3M*	Parallel 3-Phase Wye	120	11.5	0 to 140	84.0	96.0	275.00
		240	13.3	0 to 240	28.0	32.0	
W30HG2	Parallel 3-Phase, Open-Delta	240	7.5	0 to 280	24.0	31.2	160.00
		240	6.48	0 to 280	12.0	15.6	
W30HG2M*	Parallel 3-Phase, Open-Delta	240	7.5	0 to 280	24.0	31.2	190.00
		240	6.48	0 to 280	12.0	15.6	
W30HG3	3-Phase Wye	480	13.0	0 to 480	12.0	15.6	240.00
W30HG3M*	3-Phase Wye	480	13.0	0 to 480	12.0	15.6	275.00

*Cased Model



A complete line of Variac® continuously adjustable autotransformers and assemblies is produced by the General Radio Company. 350-1200-cycle models are also available. Write for complete information.

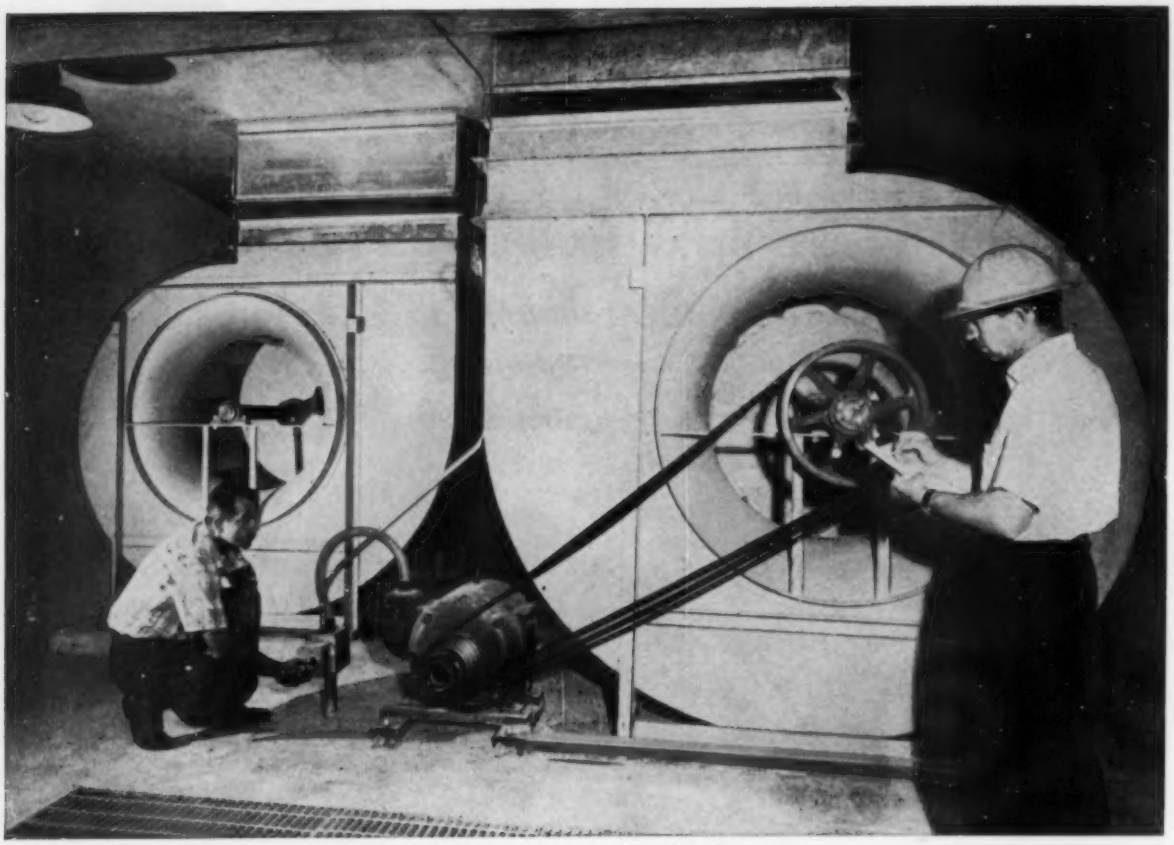
write for Complete Information

GENERAL RADIO COMPANY

WEST CONCORD, MASSACHUSETTS

NEW YORK, WOrth 4-2722, Ridgefield, WHitney 3-3140 • **CHICAGO**, Oak Park, Village 8-9400
PHILADELPHIA, Abington, HAncock 4-7419 • **WASHINGTON, D. C.**, Silver Spring, JUniper 5-1088
SAN FRANCISCO, Los Altos, WHitecliff 8-8233 • **LOS ANGELES**, Los Angeles, HOllywood 9-6201
IN CANADA, Toronto, CHerry 6-2171

Circle 581 on postcard, page 33



"Bacteria Tight" *Peerless Electric*® Blowers

135 OF THEM ASSURE CONSTANT VENTILATION AT NATIONAL ANIMAL DISEASE LABORATORY, U.S. DEPARTMENT OF AGRICULTURE, AMES, IOWA

• A constant supply of fresh air and an equal amount of exhaust air are of critical importance at this 14-million-dollar installation. Lack of proper ventilation would seriously undermine the success of any experiment being conducted here. For every group of supply and exhaust fans and blowers, there is stand-by equipment of identical capacity. Blowers are welded "bacteria tight" and duct work is sealed to prevent any contamination from one research section to another. Entire installation is capable of delivering 1,042,375 cfm at capacity operation.

ARCHITECTS AND ENGINEERS: Ralph M. Parsons Co., Los Angeles, California
Brooks-Borg, Des Moines, Iowa

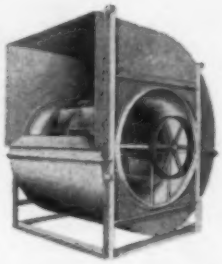
GENERAL CONTRACTOR: Beck-Truckee Co., Dallas, Texas

MECHANICAL CONTRACTOR: Natkin and Company, Omaha, Nebraska

SHEET METAL CONTRACTOR: Iowa Sheet Metal Contractors, Inc.,
Des Moines, Iowa

Manufactured and sold in the western states by Master Fan Corporation, H. K. Porter Company, Inc., 1323 Channing Street, Los Angeles 21, California. NOW AVAILABLE —Centrifugal Blowers to 132" wheel diameter, Turbo Blowers to 55 S. P., Tube and Vaneaxial Blowers and Industrial Fans to 104" wheel diameter.

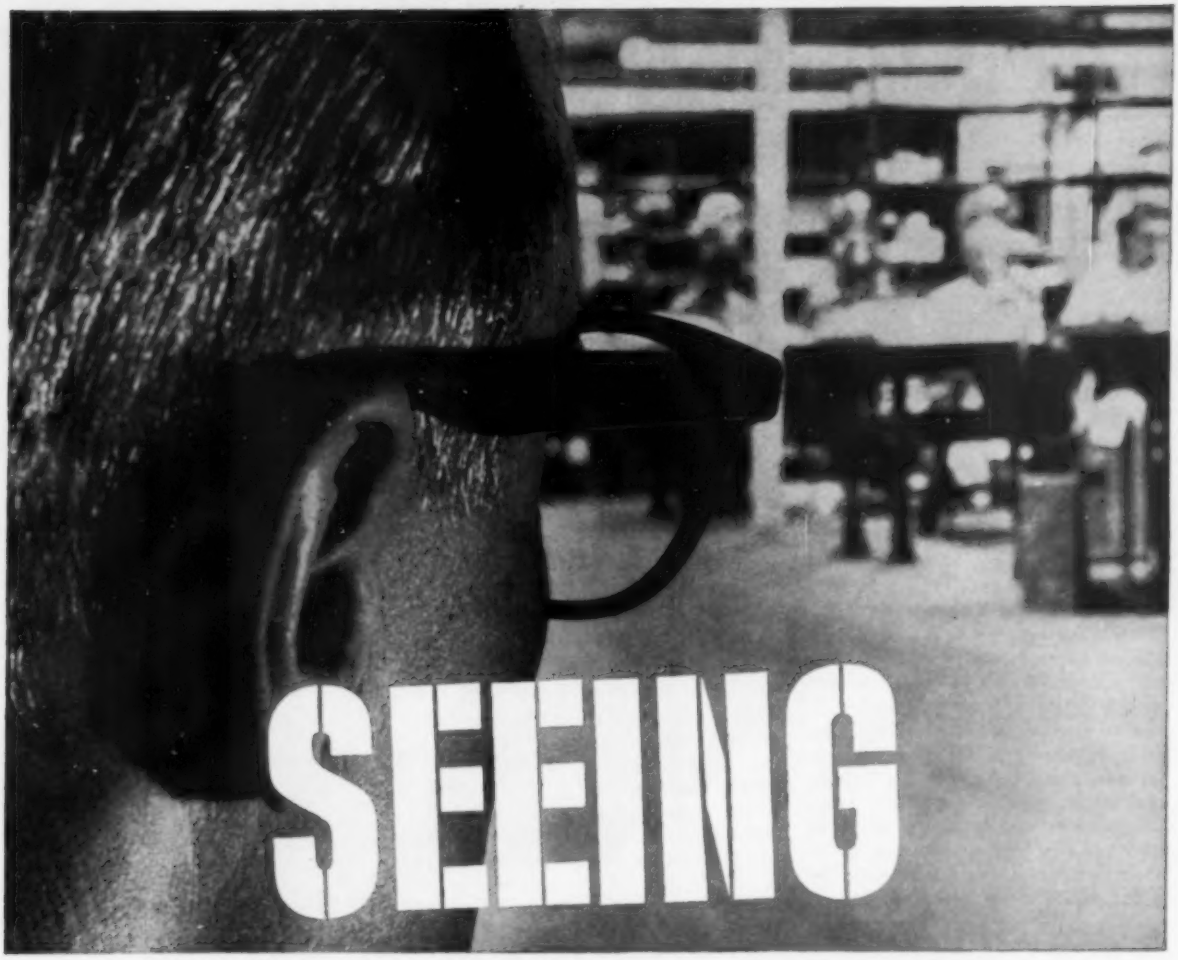
Investigate Peerless Air Moving Equipment Today! Write to Peerless Electric Division, H. K. Porter Company, Inc., 1405 West Market Street, Warren, Ohio.



PORTER **PEERLESS ELECTRIC DIVISION**
H. K. PORTER COMPANY, INC.

Member—Air Moving and Conditioning Association, Inc.

Circle 582 on postcard, page 33



WHEN THE PROBLEM CALLS FOR PAINT THE BEST ANSWER

IS INVARIABLY **Barreled Sunlight** ENGINEERED Paints

Short-sighted plant lighting programs often overlook the importance of proper paint selection as a vital aid to good seeing conditions. Yet the *right* paint, chosen with an eye for visual efficiency and comfort, can make a valuable contribution to employee health and morale.

This is why more and more responsible plant maintenance men look to Barreled Sunlight Paint representatives for *engineered* color recommendations. They've learned that a free Barreled Sunlight Color Survey enables them to select paints which make the most of natural and artificial lighting. They've learned, too, that Barreled Sunlight Engineered Paints go on faster with fewer coats . . . and retain their luminous look far longer.

See for yourself. Invite the man from Barreled Sunlight for a free demonstration and discussion of *your* plant painting problems now.

FREE! BARRELED SUNLIGHT PAINT "SLIDE GUIDE"

Contains complete information on Barreled Sunlight Exterior and Interior Finishes, Colors, Primers, and Thinners plus full application and special resistance data.

BARRELED SUNLIGHT PAINT COMPANY
1258 Georgia Avenue, Providence 5, Rhode Island

I want to learn more about Barreled Sunlight Engineered Paints and what they can do for us.

☐ Please have your representative call me to arrange an appointment without obligation.

☐ Please send me your new "Slide Guide" to Barreled Sunlight Paints.

Name.....

Title.....

Company.....

City..... *Zone*..... *State*.....

Circle 583 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

Edited by M. E. Heniken

Use the Reader Service Cards provided on pages 33-34 to ask for more information on this equipment. Circle item numbers of products in which you are interested.

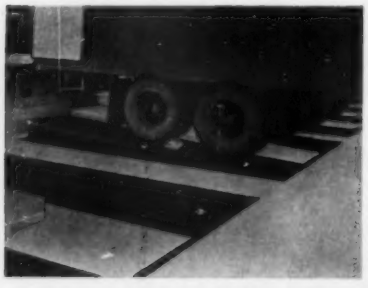
BREAKERS designed to meet future requirements

Design features of the FP (future planned) line of power circuit breakers provide benefits in cost, safety and flexibility of low voltage electrical systems. Higher interrupting capacities and continuous-current rating of the line offer advantages of fully-rated distribution systems at cascade-system prices. The line is divided into two groups; the FP-50 series consists of three increased frame-size breakers based on continuous current ratings of 400, 800 and 2000 amp with 50,000-amp asymmetrical I.C. at 600 v; the FP-100 series offers two frame sizes with 100,000-amp asymmetrical I.C. in continuous current ratings of 3000 and 4000 amp at 600 v. Prices of the uprated FP line will be comparable to those of previous lower-rated breakers. Other featuers announced include: an improved, fast-acting stored energy mechanism; adjustable trip unit, long-life contacts; and enclosures designed for versatility, compactness and accessibility. **Federal Pacific Electric Co.**

For details, circle 1 on Post Card

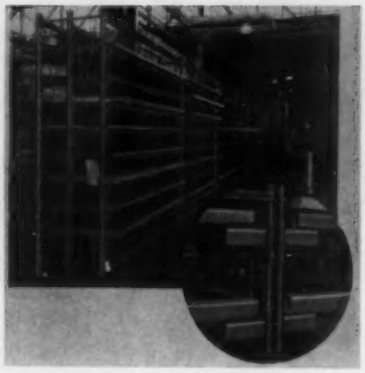
TRUCK LEVELER costs less to install, operate

The Dockmiser is a package design truck leveler offering lower initial cost and operating economy. No underground piping is required, and pit requirements are minimal. Two men can install the self-contained Dockmiser in



about 3 hr. Maintenance is simplified. The entire power system, including rams, is removed through the servicing access opening without entering the pit. The Dockmiser has a built-in wheel locator to speed trailer positioning. The unit's capacity is 40,000 lb sustaining and net lifting. Platforms are floored with non-skid steel plate, come in two sizes. Autoquip Corp.

For details, circle 2 on Post Card



STORAGE RACKS for sheet metal adjust to any level

Slide-n-Lock Posts save space by eliminating stringers, except at top and bottom where needed as tie bars. The material is kept on rugged square tubing pallets supported on short cantilever arms. The arms attach quickly to the posts (see inset) without bolts and adjust to any level. Each frame has three posts, supporting the pallets at six places. Fork guides occupy space where stringers normally would be. American Metal Products Co.

For details, circle 3 on Post Card

MORTAR ADDITIVE for bonding Styrofoam insulation

Styrocrete, a latex additive for Portland cement mortar, is suggested for use in bonding Styrofoam insulation boards to masonry, cured concrete, metal or other surfaces. It is expected to have broad application in low temperature installations. The synthetic latex particles reduce water and vapor transmission and result in stronger, tougher mortars. One 5-gal pail of Styrocrete is sufficient for 3 cu ft of the mortar and when applied at $\frac{3}{16}$-in. thickness, this same amount covers about 200 sq ft. The Dow Chemical Co.

For details, circle 4 on Post Card

BACTERICIDE stops growths in machine coolants

Bactericide T works on bacteria and fungi to destroy and prevent growths and odors in industrial emulsions and machining solutions. It is used at concentrations of 0.1 to 1.0 per cent to inhibit growth of some 20 objectionable organisms. Baker/Gubbins Co.

For details, circle 5 on Post Card

COOLING TOWER provides big capacity in small size

Space-saving in design, CompacTower is a water cooling tower with capacity range from 100 tons up, claimed to offer superior cooling performance per cubic foot of structure. "Curtain wall" casing, honeycomb segments in filling,

air intake and air discharge areas plus advanced design in cold water basins combine to minimize operating weight —of importance to buildings not designed for heavy roof loading. Erection is fast; the towers ship in two easily-joined sub-assemblies. All are modular units, permitting easy multi-cell installation. CompacTowers are also available in all-metal, fireproof models. Data provided in Buletin CT-61. The Marley Co.

For details, circle 6 on Post Card

PAINT ARRESTOR FILTER is more absorbent

Designed to fit into standard holding frames, without grids or accessories, the AG Paint Arrestor Pad is a glass-fiber product offering lower resistance to air flow and greater absorbency. One 2-in. AG pad is said to do the work of two conventional 1-in. pads. The fiber glass filaments become progressively denser from the air entering side to the back and this graded density resists "face loading" and provides greater efficiency and longer service. Because the pads permit free air flow there is less "drag" on the exhaust fans—and fans, motors, duct and even the spray booth itself stay

One slip can cost more than USS Multigrip

Your workers stand—and often fall—in slippery places. Falls account for about 1 in every 5 industrial injuries.

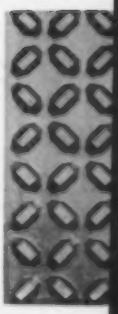
You can eliminate many slips and falls by installing USS Multigrip Floor Plate around machines, on loading platforms, stair treads and main shop aisles.

Multigrip means safe footing wherever it's used. Hundreds of little cleats give safe traction in any direction. Water drains off quickly. Oil and grease can be easily removed with the usual cleaning compounds.

Saves money, too! Where floors take a heavy pounding from traffic, Multigrip will stand up for years. It won't splinter or crack and can be installed in extra-wide plates. There's little or no maintenance.

For more information about USS Multigrip Floor Plate, write United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania. *Sold by leading distributors from coast to coast.*

United States Steel Corporation • Columbia-Geneva Steel Division • Tennessee Coal and Iron Division • United States Steel Export Company



USS United States Steel

TRADEMARK

This mark tells you a product is made of modern, dependable Steel.

PLANT ENGINEERING EQUIPMENT

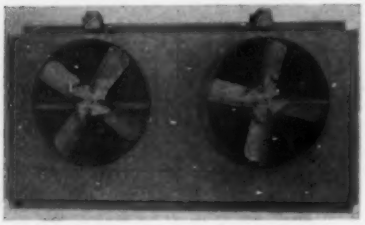
(Begins on page 152)

cleaner. A bank of pads can be changed in minutes. They come in three standard sizes—one is 20-by-20 in. American Air Filter Co., Inc.

For details, circle 7 on Post Card

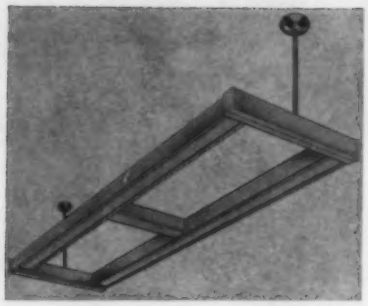
COOLING TOWER with double, fan discharge

The EC-120 is an economy model cooling tower with horizontal double-fan discharge. It has a nominal rating of 120 tons, based on a capacity of 360 gpm of water at 95 F entering water



temperature, 85 F leaving water temperature and 78 F wet bulb. Double fans draw air from the open back of the tower through the wetted deck surface to provide even air distribution. Low-speed, deep-pitch propeller fans provide quiet operation. Weatherized welded steel cabinets are normally provided, but for extra heavy duty applications 10-gage steel housing may be had. Tower also comes in take-apart design. Halstead & Mitchell Co.

For details, circle 8 on Post Card



FLUORESCENT FIXTURE for higher lighting levels

Semi-indirect HQ Fluorescent Fixture features 800 ma high output and 1500 ma very high output lamps to provide higher lighting levels with comfort. Fixtures are supplied with stems and canopies for pendant mounting approximately 18 in. below ceiling (recommended). Shielding is available in 45-by-45 deg plastic louvers or diffuse polystyrene panels. Sylvania Electric Products Inc.

For details, circle 9 on Post Card

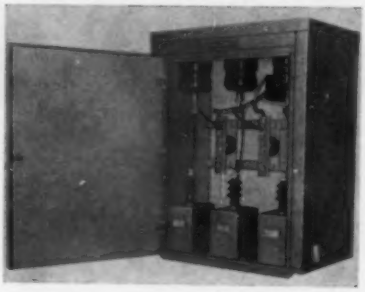
CONTACT ADHESIVE bonds plastic, aluminum to plywood

Ankweld is suggested for bonding plywood panels to wall studs, and in laminating virtually any material to plywood or hardboard. Resistant to water, oil, gasoline and extremes of temperature, it also offers flexibility for use on curved surfaces, manufacturer notes; and so tenacious is the bond that plastic, linoleum or aluminum laminations to plywood can be fed through a rotary saw immediately after assembly. A two-surface adhesive, Ankweld is sprayed or brushed on materials to be adhered. Any time from 10 min to 4 hr after application, materials can be joined. Cement accidentally brushed on another surface can, when dry, be rubbed off. Anchor Adhesives Corp.

For details, circle 10 on Post Card

LINE SURGE PROTECTION for rotating a-c machines

Custom designed for each application, Surgepaks protect rotating a-c machines against line surges caused by switching, faults, or lightning. They are attached and wired into the machine's circuit by either manufacturer or user. Ratings are available for system voltages from 2400 to 13,800 v. The device is equipped for a three-phase installation, one lightning arrester and one capacitor tied in parallel to ground on each phase, with isolated



buses and common ground connection. Basic components consist of lightning arresters with low discharge and spark-over characteristics in ratings from 3 to 15 kv; and surge capacitors to eliminate possibility of turn-to-turn flash-over by decreasing the slope of wave fronts impinging on windings. Westinghouse Electric Corp.

For details, circle 12 on Post Card

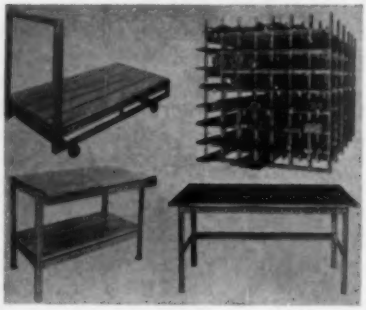
DRY-FILM LUBRICANT serves extreme environments

Molykote X-15 is an inorganic-bonded, dry-film lubricant with useful temperature range of —300 to 1200 F. According to manufacturer, it is insensitive to liquid oxygen; unaffected by up to 5 by 10^8 roentgen gamma radiation; retains its lubricating properties under vacuums to 10^{-9} mm of Hg. Applied by brush or spray, Molykote X-15 air dries to a tough, resilient coating in 1 hr at room temperature. Baking increases wear life. The Alpha-Molykote Corp.

For details, circle 13 on Post Card

FRAMING KITS for making racks, benches and carts

These kits of AIM Slotted Angle offer an easier and lower cost way to acquire most needed styles and sizes of storage units, special purpose racks etc. AIM Slotted Angle is a framing material with slots and holes for quick assembly by bolting. Formerly it was sold only in standard lengths. The new kits provide all parts cut to length and all assembly hardware. Included in the line are 120 storage units, 82 racks, 17 work benches, 13 tables and a foreman's desk and 27 carts—a few are illustrated. The units can be used in combination with existing installations



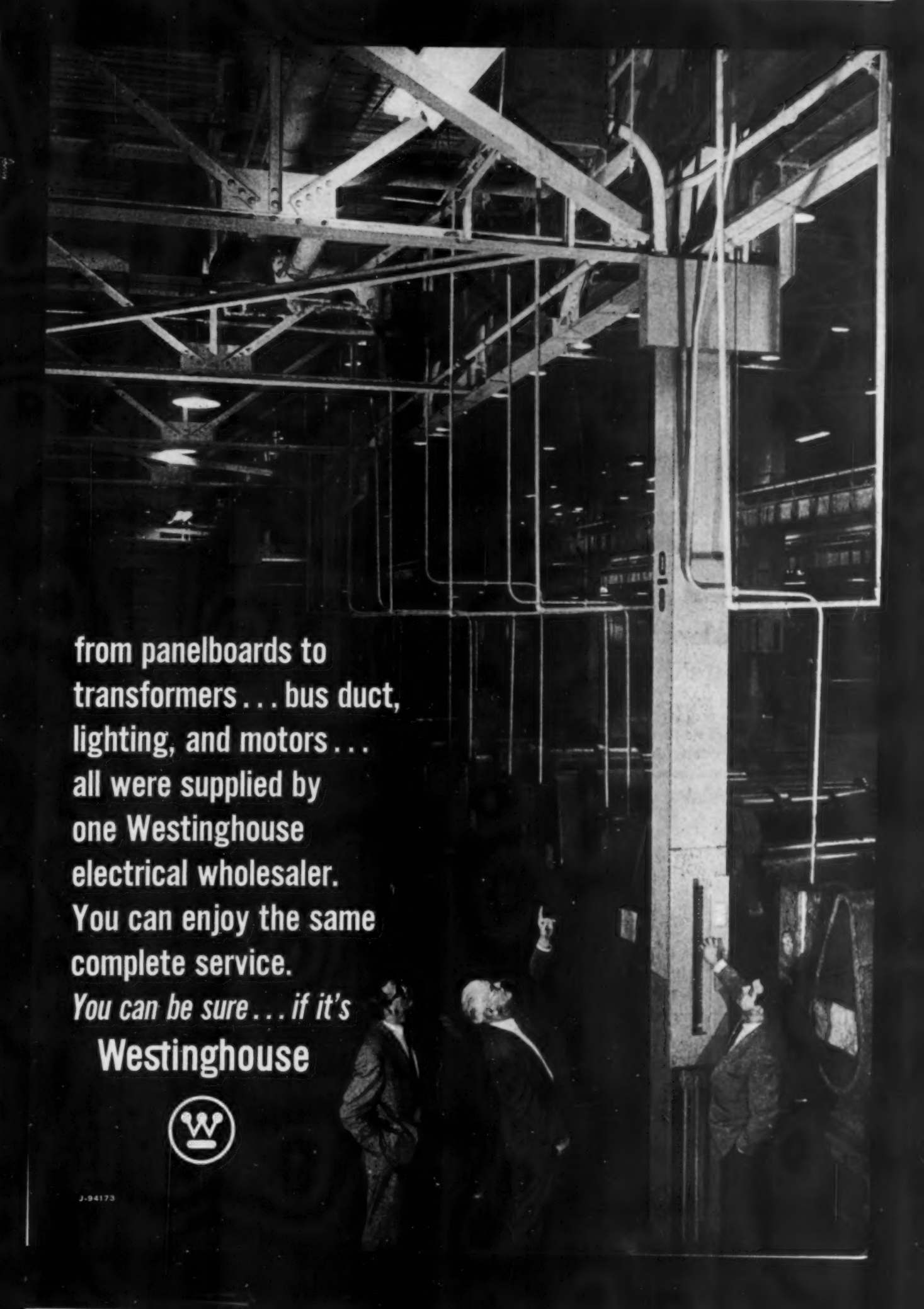
to enlarge storage capacity, can be unbolted and re-assembled to suit changing requirements. Acme Steel Co.

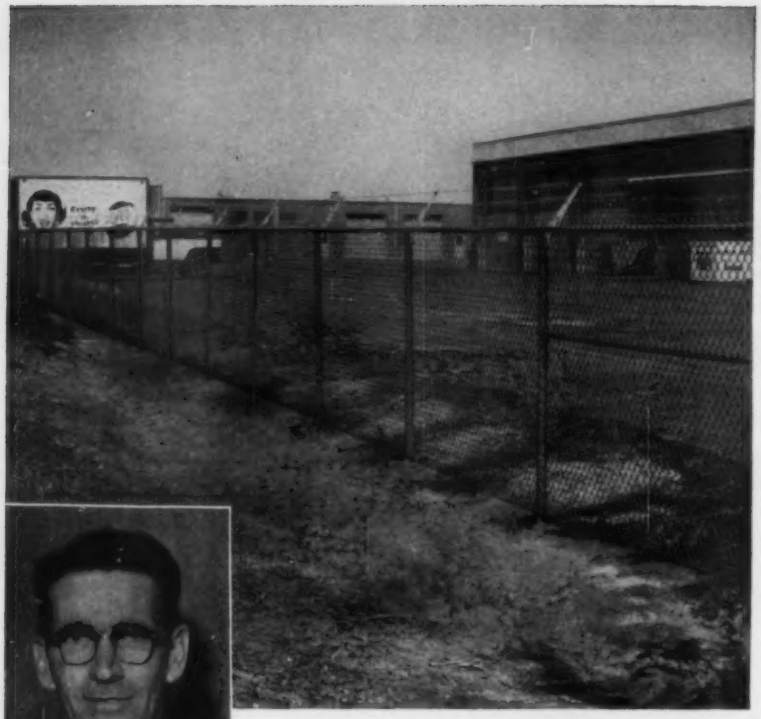
For details, circle 11 on Post Card

TANK CONTENTS GAGE shows chemical level

Model 580 Tank Contents Gage is designed for economical measurement of chemicals in storage tanks, including high pressure chemical applications to 1000 psi. Corrosion resistant parts are Type 316 stainless steel. Tank-site indication is provided by dial and pointer indicator. Magnetic coupling drive action transmits float and arm movement to indicator, with accuracy given

Circle 585 on postcard, page 33 →


from panelboards to
transformers . . . bus duct,
lighting, and motors . . .
all were supplied by
one Westinghouse
electrical wholesaler.
You can enjoy the same
complete service.
You can be sure . . . if it's
Westinghouse
J-94173



says W. L. Hause, Assistant to the President, Pepsi-Cola Bottling Co., Inc., Pennsauken, N. J.

"... makes a safe outdoor 'garage' for our 45 trucks ..."

"Our plant yard is a very necessary part of our operation, so our Anchor Fence must satisfy a number of needs. And it does. Keeps out trespassers of all ages, makes a safe outdoor 'garage' for our 45 trucks, permits all-weather storage for a great amount of other equipment, too. Anchor Fence has also proved ideal for controlling traffic on our property—not only in and out of our plant yard, but around it, as well. As for maintenance—our first Anchor Fence was installed in 1957, and it's still repair-free."

For more information on how Anchor Fence can help *your* operation, call your local Anchor Man. For your *free* Anchor Fence Industrial catalog, fill out and mail in the coupon below.

ANCHOR FENCE
Division of ANCHOR POST PRODUCTS, INC.

Plants in Baltimore, Md.; Houston, Texas; Whittier, Calif.
Sold direct from factory branches in principal cities.

ANCHOR FENCE
6661 Eastern Avenue, Baltimore 24, Maryland
Please send me my free copy of the Anchor Fence Industrial catalog.

Name.....

Company.....

Street.....

City.....Zone.....State.....

Circle 586 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 152)

as ½ of 1 per cent. Clock-type dial has adjustable check pointer which can be set for observing liquid level changes over specific time interval. Bulletiin 833 has more data. The Liquidometer Corp.

For details, circle 14 on Post Card

COMPACT MACHINE scrubs, and squeegee-dries floors

Intended primarily for medium size floor areas up to 20,000 sq ft, the ClarkeAmatic Scrubber-Vac Model PS-18BP scrubs, picks up dirt and cleaning solution, and squeegee-dries floors. It cleans an 18-in. swath and

operates on battery power. Operating speed is about 120-132 fpm and scrubbing speed is 3500 to 6000 sq ft per hour. It weighs 360 lb including the two 12-v batteries. A feature is its orbital scrubbing action. The 5-by-18 in. scrubbing head has a replaceable nylon pad and operates at an orbital speed of 3400 rpm. The machine has a constant duty, rubber-mounted vacuum motor which drives a two-stage turbine and provides a 60-in. water lift with closed orifice. Vacuum tank has 6½-gal recovery capacity; clean water tank has a 5-gal capacity. The unit, including battery charger will sell for under $835. Clarke Floor Machine Co.

For details, circle 15 on Post Card

OIL SEAL has filled-Teflon sealing element

Positive/Seal Klozure Oil Seals are designed to resist more extreme temperatures, are chemically inert and unaffected by corrosion. Tests are said to show that seals will not wear or score the shaft on which they are used and will seal at speeds to 3000 fpm. Sealing features include steel shell enclosing component parts, gasket fitted

FIT STEAM PRESSURES TO YOUR NEEDS

economically

with SK

JET COMPRESSORS

Convert plant steam pressure to meet varying demand, simply and at low cost, with a SK Jet Compressor.

A jet compressor can be employed to replace a reducing valve and simultaneously produce useful work, by using high pressure steam to entrain and boost low pressure or waste steam to a usable pressure.

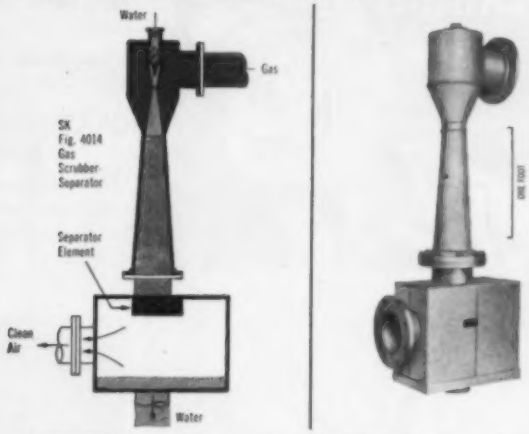
For details—ask for Bulletin 4F.

Or circle 587 on reply card

SK Introduces New

GAS SCRUBBER-SEPARATOR

New "packaged" unit offers never-before-obtainable efficiency. Combines SK ejector-venturi scrubber with new separator which reduces liquid carryover to 0.00002 gal. per 100 cfm. Unit, called "Fig. 4014" is low cost, compact. Stocked in popular sizes for immediate shipment.



For details—ask for Bulletin Supplement 4R.

Or circle 588 on reply card

HEAT AND AGITATE LIQUIDS

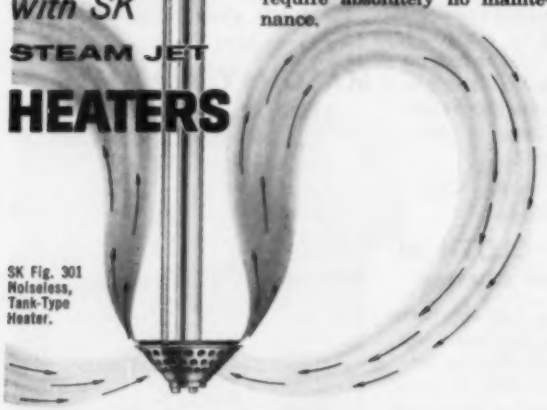
Simultaneously

with SK

STEAM JET

HEATERS

Your plant steam can be utilized economically to heat and agitate liquids in tanks or in pipelines. Through the use of a SK Steam Jet Heater, steam can be mixed with cold liquids to provide heat uniformly, quietly, and efficiently, and to prevent settling. Most types have no moving parts and therefore require absolutely no maintenance.



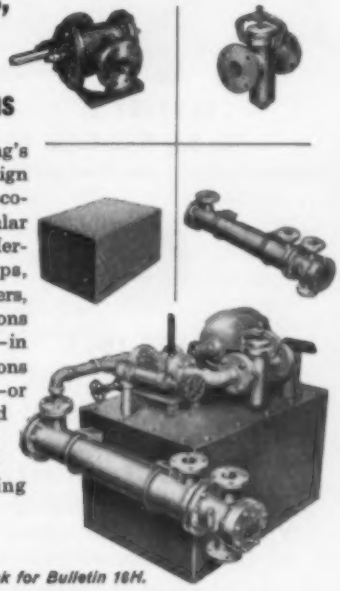
SK Fig. 301 Noiseless, Tank-Type Heater.

For details—ask for Bulletin 3A.

Or circle 589 on reply card

SK FLUIDS HANDLING EQUIPMENT

Supplied in units, combinations, packaged systems



Schutte and Koerting's "building block" design permits you to meet economically your particular job requirements. Herringbone gear pumps, heat exchangers, strainers, tanks, and foundations are available singly—in engineered combinations of two or more units—or as complete packaged systems for oil burning, oil lubrication, or other fluids handling applications.

For details—ask for Bulletin 16H.

Or circle 590 on reply card

JET APPARATUS: Ask for Condensed Bulletin J-1.

ROTAMETERS & FLOW INDICATORS: Ask for Condensed Bulletin M-1.

VALVES: Ask for Condensed Bulletin V-1.

HEAT TRANSFER APPARATUS: Ask for Condensed Bulletin HT-1.

GEAR PUMPS: Ask for Bulletin G-1.

Schutte and Koerting

COMPANY

MANUFACTURING ENGINEERS SINCE 1876

2279 State Road, Cornwells Heights, Bucks County, Pa.

Phone: MErcury 9-0900 TWX: Cornwells, Pa. 69-U

TORQUE-ARM

America's most widely used shaft mounted speed reducers!

FLEXIDYNE

The Dry Fluid Drive

New soft starts . . . overload protection!

TAPER-LOCK CHAIN COUPLINGS

No reboring — no waiting!

•

Write for Bulletins!

- Torque-Arm — 55 models — data.
- Flexidyne Drives & Couplings.
- Chain Couplings and Sprockets.

DODGE MANUFACTURING CORPORATION
2700 Union Street • Mishawaka, Indiana

DODGE
of Mishawaka, Ind.

PLANT ENGINEERING EQUIPMENT

(Begins on page 152)

tightly into position to hold sealing element in place and the filled-Teflon element which rides firmly against shaft. Garlock Inc.

For details, circle 16 on Post Card

GRATING has closer mesh for greater strength

While retaining the high visibility, ventilation and easy maintenance features of open flooring, this closer mesh grating is described as offering a 60 per cent increase in load-bearing

capacity. It uses 36 bars in each 2-ft wide panel. Clear opening is ½ in. The grating is also available with 37 bars in each 2-ft panel (⅜-in. opening between bearing bars). Fabrication by an electroforging process provides one-piece construction of bearing and cross bars which are twisted for a non-slip surface. The grating comes in lengths of 20 ft or more. Finishes are galvanized, standard paint, or Ponbake—an epon process resistant to wear, weathering. Blaw-Knox Co.

For details, circle 17 on Post Card

FIRE-RESISTANT CLOTH of bonded aluminum asbestos

Intended for fire entry and approach garments, Kamklad is also suited for fire curtains, baffles, reflective blankets, folding doors and partitions. A combination of highly reflective aluminum foil and fire-resistant asbestos cloth "welded" together by a new process, this material offers several advantages over conventional alumized fire cloth. It has higher resistance to heat and abrasion because the solid aluminum barrier is 50 times thicker than vapor deposition products, manufacturer states, and it wears better because the tightly woven yet flexible abestos cloth retains its shape, construction and strength even after direct exposure to fire or water. Also, it doesn't peel or crack because the method used to bond the aluminum foil to the asbestos cloth causes the two materials to act as one. A sample is available. Keasbey & Mattison Co.

For details, circle 18 on Post Card

QUICK DRYING PAINT provides years of protection

Teflate, an odorless, quick-drying, duable paint for wall and floors, comes in eight colors, plus white, and sets up a moisture barrier that shuts out water penetration of outside, above-grade walls. It resists chemical fumes, salt water, grease, oil, sea air and atmospheric conditions in industrial areas. Teflate is suggested for any surface but wood, its alkali-proof, dust-repellant finish is non-chipping, stainless and will not flake, blister or peel. Its coverage is approximately 300 sq ft per gal, per coat. Flexrock Co.

For details circle 19 on Post Card

PLASTIC PRESSURE PIPE withstands 100 psi

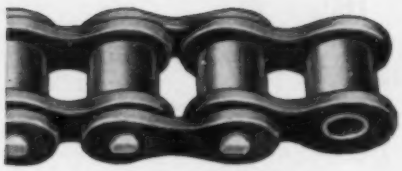
Corrosion-proof Duracor reinforced plastic pressure pipe capable of withstanding pressures to 100 psi at temperatures as high as 250 F is available in 10- and 20-ft lengths and is furnished in fiber glass mat and cloth construction. Wall thickness ranges from ¼ to ⅝ in., depending on pressure and temperature requirements. It is suitable for above-ground or underground installation. The Ceilcote Co.

For details, circle 20 on Post Card

MASONRY HAMMER is stronger, more powerful

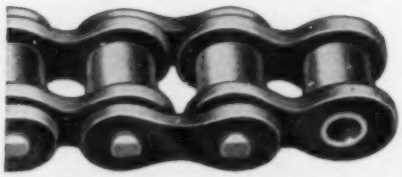
An improved version of company's Model 726 Roto-Hammer has a more powerful motor that develops extra power under load, stronger die-cast

housing, and longer, more conveniently located side handles for better leverage control. Like the previous model, it has three-way action. It can combine hammering action with automatic power rotation; it can hammer

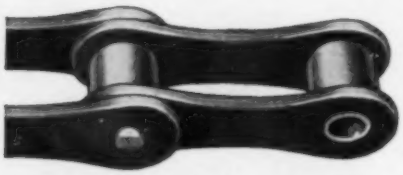


SINGLE STRAND

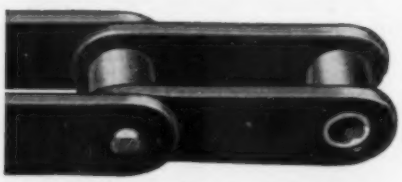
DOUBLE STRAND



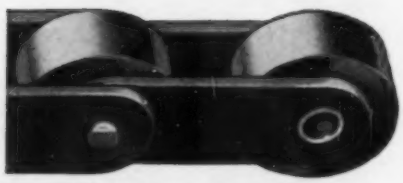
SINGLE STRAND, HEAVY SERIES



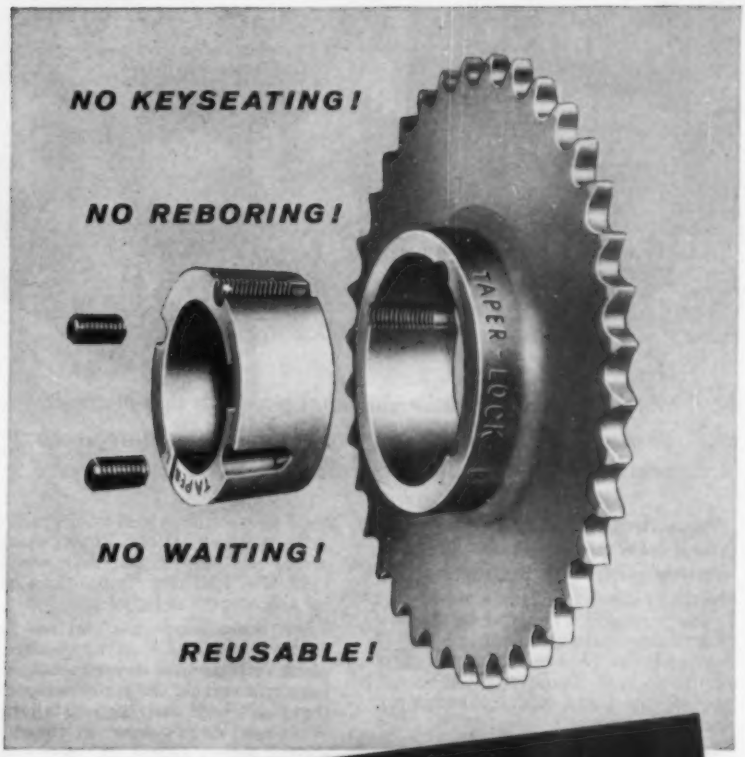
DOUBLE PITCH TRANSMISSION



DOUBLE PITCH CONVEYOR



DOUBLE PITCH CONVEYOR, LARGE ROLLERS



TAPER-LOCK SPROCKETS DODGE ROLLER CHAIN

DODGE Quality Roller Chain, teamed with Dodge Taper-Lock Sprockets, results in chain drives and chain conveyors that have the precision, efficiency and stamina necessary for the real economy of *long life*.

Moreover, Taper-Lock's reusable bushing makes a difference in overall cost. The ease of Taper-Lock mounting, the elimination of reboring, keyseating, and wasted time, add to the saving. Precision machining and true articulation lengthen the life of *both* sprocket and chain.

The Dodge line of chain, including standard attachments, is extensive. It meets a high percentage of all chain requirements.

In the Double Pitch series (both Transmission and Conveyor) the sizes which require special spacing for perfect tooth action are offered from stock in special double pitch design — to double the life of the chain and the sprocket!

Ask your local Dodge Distributor. Or write us for bulletin.

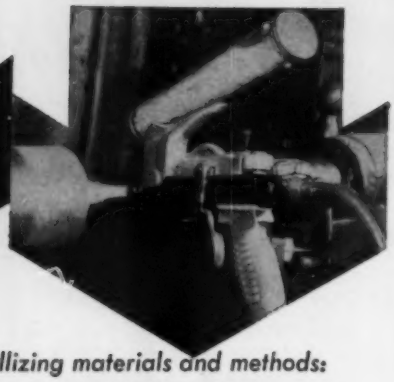
DODGE MANUFACTURING CORPORATION, 2700 Union St., Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look under "Dodge Transmissioneer" in the *white* pages of your telephone directory, or in the yellow pages under "Power Transmission Machinery."

DODGE
of Mishawaka, Ind.

Circle 591 on postcard, page 33

DO YOU KNOW WHAT METALLIZING CAN DO FOR YOU TODAY?



With today's improved metallizing materials and methods:

***Plant executives* find new ways to slash maintenance costs, reduce downtime, cut machine parts inventory...**

These real-life examples show how plants save money with metallizing:

Necks of winding rolls in a textile mill were formerly repaired by a slow machining method, requiring highly skilled labor. Now the worn necks are built up with flame sprayed metal, quickly machined to size. Savings run $20,000 a year.

Valve plugs and seats, working in sand, oil and salt water, lasted only a few hours in service. Hard-faced by welding, a set cost $155, lasted from 3 to 8 hours. When flame sprayed with tungsten carbide powder, service life was increased to a minimum of *2 weeks,* 4100% longer! Cost of metallized set, $73. But reduced downtime far outweighs the dollar savings.

A Connecticut company was sending its worn shafts out for repair by welding at a cost of $50 each. Then they found a local shop that specialized in metallizing was able to do a better job for $27.50. The same job shop salvaged a big degreasing tank, value $2,850, by flame spraying with zinc for $683. The shop made money, the customer saved money.

A shipbuilding company installed metallizing equipment to repair such parts as pump rods, pistons, crank shafts for diesel engines, stern bushings, valve stems. A badly worn tugboat shaft, replacement cost $3,000, was repaired and made better than new for $400. That job alone more than paid for the METCO equipment.

From these cases you can see how modern metallizing pays, whether in plant maintenance departments or in job shops serving the many companies that don't need their own installation. Wherever there's wear, in rotary or sliding action, there's an opportunity to save money and make money.

New and improved materials

Among these new materials are a number of nickel, chrome, boron hard facing powders. Sprayed tungsten carbides are also widely used. Many others are available to give new values to the basic benefits of metallizing, which may be summarized as: less downtime; far less machining or grinding time, reduced parts inventory; and "better than new" performance of the metallized parts.

With savings like these there are big opportunities for more efficient maintenance operations, either with METCO installations or through local job shops.

To explore these advantages and see how they apply to your operation, check the coupon below and send it off today.

METCO INC.
FORMERLY METALLIZING ENGINEERING CO., INC.
Flame Spray Equipment and Supplies

1195 Prospect Avenue, Westbury, L. I.
New York Telephone: Edgewood 4-1300
Cable: METCO. In Great Britain: METCO, Ltd., Chobham-near-Woking, England

METCO INC., 1195 Prospect Avenue, Westbury, L. I., New York

How to SAVE MONEY and cut downtime with Metallizing

☐ Send copy of Bulletin 15, "How to Save Money and Cut Downtime with Metallizing"
☐ Have Field Engineer Call

Name _____
Title _____
Company _____
Address _____
City _____ Zone _____ State _____

Circle 592 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

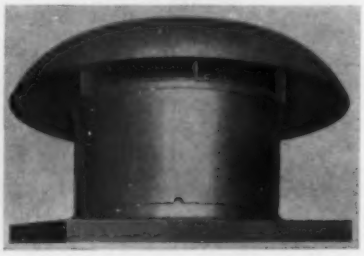
(Begins on page 152)

without rotary action; it drill without hammering action. Accessories—including four types of percussion rotary bits for simultaneous drilling and hammering—add to versatility of the tool. Model 726 weighs 13¾ lb, makes 500 rpm, delivers 2400 blows per minute, drills holes from 11/64- to 1½-in. diam. Skil Corp.

For details, circle 21 on Post Card

ROOF VENTILATOR is low and rainproof

This mushroom-head roof ventilator is announced as a completely rainproof low silhouette roof unit. It is available

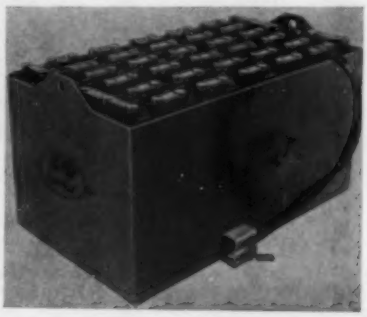


in 24- to 48-in. sizes with a choice of fans in each size. Available accessories include wire mesh bird screens and manual or motor-operated shutters. Hartzell Propeller Fan Co.

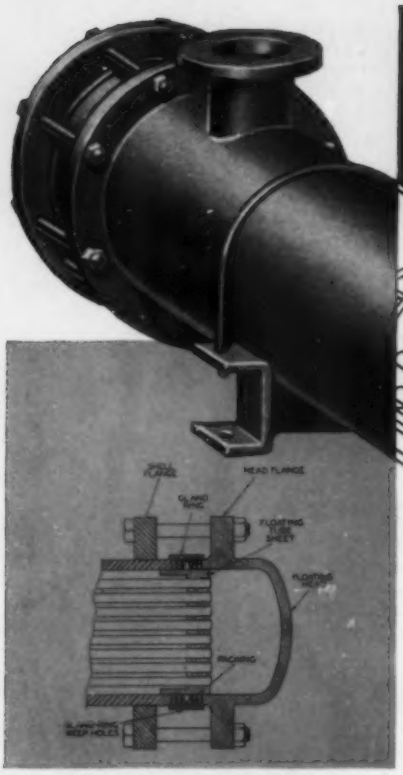
For details, circle 22 on Post Card

HI-CAPACITY BATTERY gives trucks more power

Type HY Battery, for industrial trucks, gives more power by utilizing the maximum amount of power compartment space. It provides 85 amp-hr/positive plate at 6-hr rate, a capacity increase of 18 per cent over company's Type HC Battery. Additional capacity is obtained by increasing cell height less than 10 per cent. Rating is based on discharge to 1.75 final volts per cell. It has an initial specific grav-



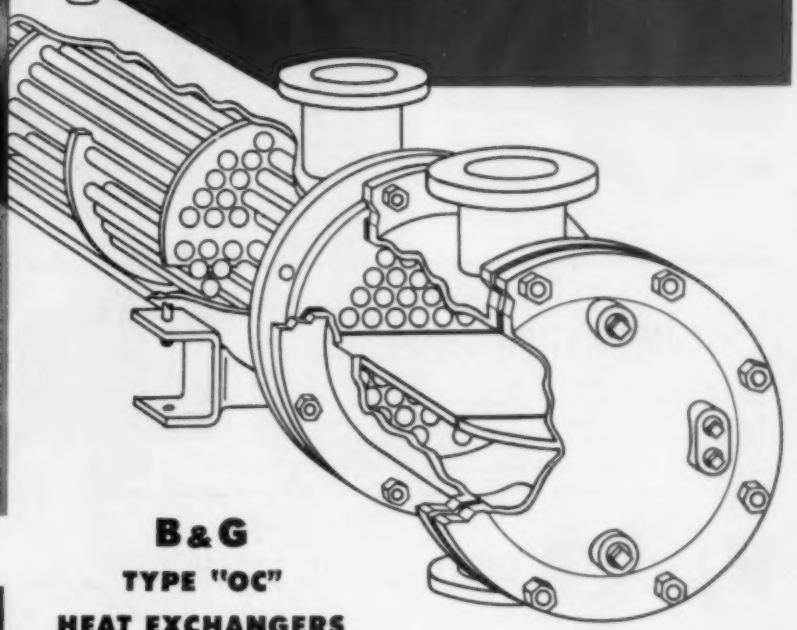
FOR MORE DEPENDABLE HEATING AND COOLING OF LIQUIDS AND GASES



Cross section of Type "OC" Heat Exchanger showing floating head construction.

B&G Heat Exchangers are welded in specially designed fixtures by expert workmen.

All B&G Heat Exchangers are built to A.S.M.E. Code requirements and are so stamped.



B&G TYPE "OC" HEAT EXCHANGERS

For heating or cooling a wide variety of liquids and gases, "OC" Heat Exchangers offer numerous design and construction features which are a warranty of long life and efficient performance.

These units have removable tube bundles with an internally packed floating head. Sizes range from 6″ through 30″ diameters, lengths from 2′ through 20′. Standard material includes steel shells and tube sheets, cast iron heads and copper tubes. Stainless steel tubes, tube sheets and heads are also available. The design of "OC" exchangers may be varied for channel or bonnet heads in both single and two-pass construction.

B&G "OC" Heat Exchangers are not only engineered to top efficiency but are constructed to the uncompromising standards of quality and safety demanded by the A.S.M.E. Code.

With each B&G "OC" Exchanger, a Manufacturer's Data Report for Unfired Pressure Vessels, Form No. U-1, as required by the A.S.M.E. Code rules, is furnished. This form is signed by a qualified inspector, holding a National Board Commission, certifying that the construction conforms to the latest A.S.M.E. Code for unfired pressure vessels. The A.S.M.E. "U" symbol is stamped on each exchanger.

These exchangers are custom-designed units, built to your specifications. Inquiries are invited.

BELL & GOSSETT
COMPANY

Dept. GT-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong, Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

Circle 593 on postcard, page 33

FOR STEAM PROCESS EFFICIENCY
WE RECOMMEND

Super-Silvertop
INVERTED BUCKET TRAPS for:

Autoclaves
Bare Pipe
Calenders
Coffee Urns
Convectors
Corrugated Paper Making Machines
Drain Pans
Dress Forms
Drips
Dry Cans
Dryers
Fan Systems
Flat Work Ironers
Header Drips
Hot Water Heaters
Kettles
Pipe Coils
Presses
Sock Forms
Steam Engines
Steam Mains
Steam Tables
Steam Purifiers
Sterilizers
Submerged Surfaces
Tumblers
Unit Heaters
Vacuum Canners
Warmers

Heat-Kwik
COMBINATION TRAPS for:

Autoclaves
Cooking Kettles
Dryers
Expellers
Kettles
Rendering Cookers
Retorts
Slashers
Submerged Surfaces
Tempering Apparatus
Unit Heaters
Water Heaters

or wherever fast heating up is desired

Quik-Flex
THERMOSTATIC STEAM TRAPS for:

Autoclaves
Cooking Kettles
Dryers
Expellers
Kettles
Retorts
Slashers
Sterilizers

or wherever fast heating up, or outside freeze-proof installations are required.

Anderson
FLOAT TRAPS for:

Air Purifiers
Gas Purifiers
Condensate Flow Meters
False Water Line Sewers
Master Trapping Separators
Air Separators
Gas Separators
Air Receivers
Gas Receivers
Gas Scrubbers

or wherever continuous discharge is necessary

Anderson has no "axe" to grind. With a complete line of traps we provide an honest recommendation for all your trap problems. Write for your free book "How to Select Steam Traps" . . . written to give you an unbiased opinion in answer to all your steam trap difficulties.

SUPER SILVERTOPS STEAM TRAPS
BY THE MANUFACTURERS OF HI-eF PURIFIERS

THE V. D. ANDERSON COMPANY
Division of International Basic Economy Corporation
1935 West 96th Street • Cleveland 2, Ohio
Circle 594 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 152)

ity of 1.275 at 77 F. Five layers of insulation and retention have virtually eliminated shedding as a factor in battery life, manufacturer says. As a result less sediment space is required so extra thick, extra long plates are used. The battery is 25¾-in. high with cover. C & D Batteries Div., The Electric Autolite Co.

For details, circle 23 on Post Card

CONTROL MONITOR has a "can't cheat" relay

The 4AA3-1 Control Monitor has a "can't cheat" feature to safeguard manual operation of industrial power machines, preventing even one stroke after a control switch has been tied down. Allowable time interval between

actuation of control switches is adjustable. Switches must be operated within set time or clutch will not be actuated. The packaged unit provides time delay circuitry for two-hand control of positive mechanical and friction clutch systems, and can be used as anti-repeat relay with a timed holding circuit or as timed holding circuit for another anti-repeat relay. Maximum current capacity is 15 amp, 115 v a-c. Priced under $50. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

For details, circle 24 on Post Card

FLEXIBLE COUPLINGS for under-water operation

Designed to run under water 24 hr per day for 3 yr without maintenance, these flexible couplings will also operate in oil, mild chemicals, and corrosives. Bodies are semi-steel castings and outside collar and inside sleeves are hot-dipped galvanized. Stainless steel set screws and retaining bolts, and bakelite cushions that are boiled to prevent swelling, distortion are other features. Horsepowers range from 2.6

INDUSTRY'S FIRST FULL LINE OFFERS

The right oil cutout at lowest cost

With the addition of a new, 15-kv, 200-ampere, sealed oil cutout to its line of quality cutouts, General Electric assures you of exactly the *right* cutout—vented *or* sealed—to meet your specific needs from 5.2 through 15 kv.

Now you can be *completely specific* with your cutout investment: buy G-E *vented* cutouts for the majority of your applications—they're completely adequate but much less expensive; buy G-E *sealed* cutouts only for such applications as submerged sites or hazardous atmospheres.

When you select from General Electric's full line of oil cutouts, you are assured of positive load break, high current-interrupting capacity, and a full range of cable terminations for fast, easy installation.

For more information on the smallest, lightest, most economical cutouts in the industry, contact your General Electric Sales Engineer. Or, write for Bulletin GEA-7191, to General Electric Company, Section 488-07, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 395 on postcard, page 33

FLIP-TOP
ROOF VENTILATOR
cuts Maintenance Cost

Entire motor-and-fan housing may be flipped back 90° to make motor, drive assembly and fan conveniently accessible above roof level. Such easy access to all working parts for quick inspection cuts maintenance costs substantially by saving time and making the work easier.

This new DeBothezat "flip-top" Power-Flow roof ventilator offers fan wheels from 12" to 48" in diameter and capacities to 43,070 CFM. A Vertical Discharge Model exhausts dust and oil-laden air at high velocity, to disperse contaminants high enough to prevent their re-entry into building's air supply.

Write for illustrated Bulletin DR-7-61

De Bothezat®
DE BOTHEZAT FANS DIVISION OF
American Machine and Metals, Inc.
Dept. PE-861, EAST MOLINE, ILLINOIS

Divisions of American Machine and Metals, Inc.

TROY LAUNDRY MACHINERY • RIEHLE TESTING MACHINES • DE BOTHEZAT FANS • TOLHURST CENTRIFUGALS • FILTRATION ENGINEERS • FILTRATION FABRICS • NIAGARA FILTERS • UNITED STATES GAUGE • AUTOBAR • AUTOMATIC DEVICES • LAMB ELECTRIC COMPANY • HUNTER SPRING COMPANY • GLASER-STEERS CORPORATION

Circle 596 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 152)

to 1365 at 100 rpm; bore solid to 9½ in. Lovejoy Flexible Coupling Co.
For details, circle 25 on Post Card

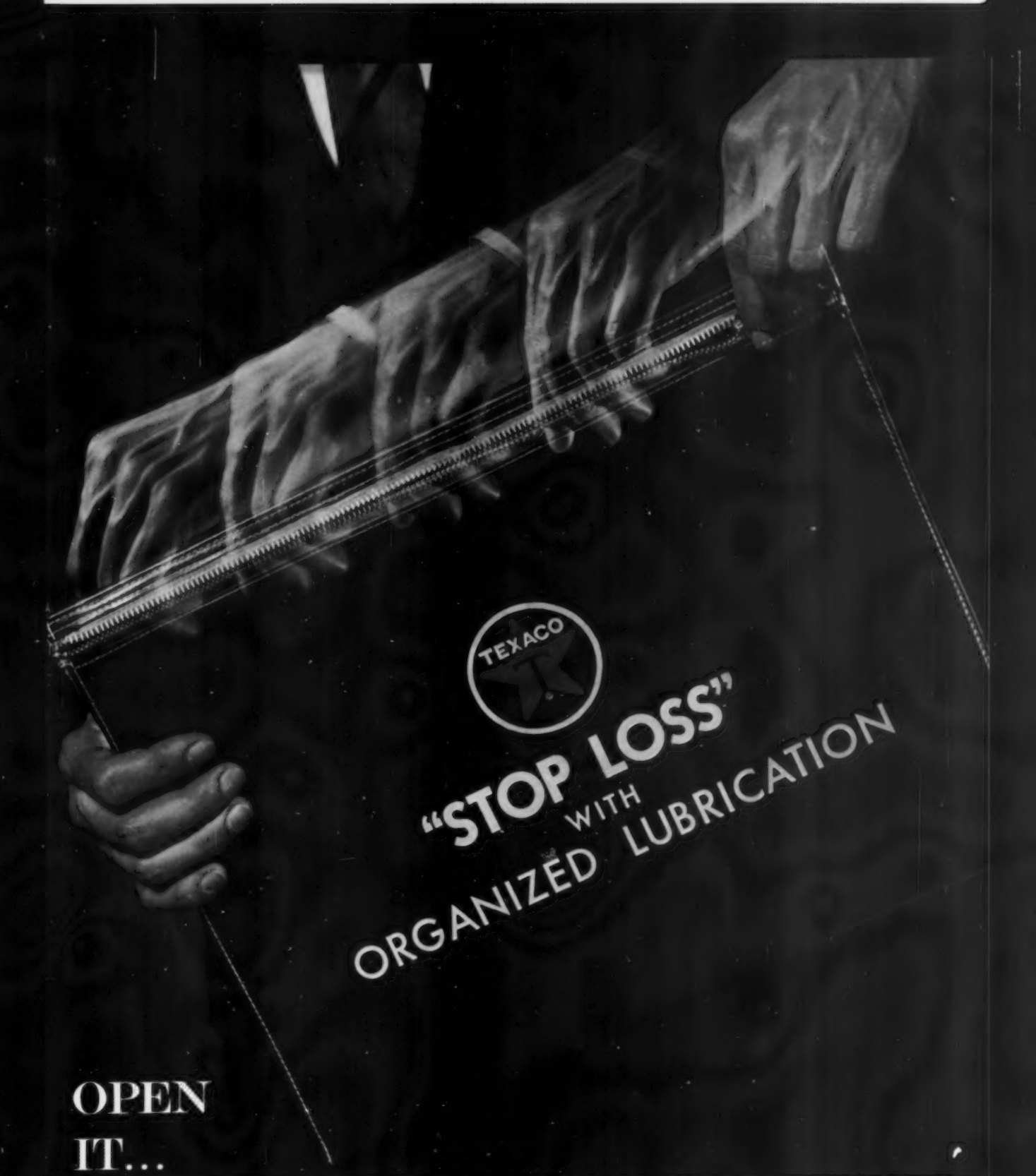
MOVABLE STAIRWAY that's economical and easy to install

Autostair is a moving stairway with two-way operation that's safe and fast. It eliminates the need for separate "up" and "down" units, and runs only

when needed. Manufactured in a compact, preassembled unit, installation costs (about $5000) and plant-operation disruption are low. It can accommodate 450 persons per hour, and is suggested for installations where the cost of a conventional moving stairway would be prohibitive. Autostair Sales.
For details, circle 26 on Post Card

SUBSTATIONS of 500-kva capacity, compact size

Package-unit substations, Power-Zones combine compact size and easy handling with capacities from 75 to 500 three-phase kva, primary voltages to 4800 v, secondary voltages to 600 v. A forced-air cooling system with high temperature alarm is available to in-



OPEN IT...

FOR UP TO 4% EXTRA NET PROFIT

In the Texaco man's briefcase is a plan for cost control through organized lubrication—Texaco's "Stop Loss" Program. Management in many different industries is already using it to cut operating costs. The resulting savings go directly into profits. Up 4% is the average. To find out how you can turn excessive costs into profit, write for our informative folder: "How to Starve a Scrap Pile." **TEXACO** INC., 135 East 42nd Street, New York 17, N. Y. Dept. E-202

No. 10 *In a series of washroom survey comments from "SBS soap counselors"*

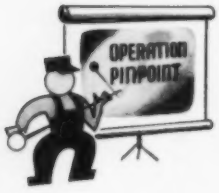
We showed them how "on-the-job" cleansing licks tough soil problems.

John Walsh

veteran SBS soap counselor, specializes in industrial soil removal. Here's his report after surveying a large paint manufacturing plant.

"Workers in certain departments of this plant are in constant contact with soils that are hard to remove or irritating to the skin . . . for instance, paints, resins, thinners, pigments, and caustic soda. Management issued some protective clothing, but this measure still left face, hands and arms unprotected. Dermititis was on the increase. What to do?

"We recommended 'bringing the washroom to the worker' by installing *SBS 30 Waterless Washstations* in all of the sensitive areas. We knew from our survey that *SBS 30* will remove all of these problem soils — quickly, safely and at very low cost per clean-up."



Money-saving suggestions like this *begin* with OPERATION PINPOINT–a thought-provoking presentation filled with facts about skin hygiene and washroom maintenance. The SBS soap counselor serving your area can pinpoint the right soap to do every skin cleansing job best and at lowest cost in your plant. Let him show you OPERATION PINPOINT . . . just call your nearest SBS office, collect.

the washword of industry

sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N. J.
CANADA: Chemical By-Products, Ltd., Toronto, Ontario

Circle 598 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 152)

crease kva capacity by one-third. Versatile construction permits use of many types of components. Metering equipment, high voltage air interrupter switches, main low voltage power circuit breakers etc. can be furnished as required. Quiet operation is emphasized. Bulletin SD-137 gives details. Square D Co.

For details, circle 27 on Post Card

THERMOSTATIC TRAP prevents live steam loss

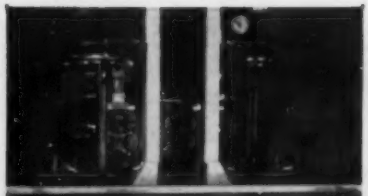
For pressures from vacuum to 150 psig and temperatures to 425 F, the N-150 trap is designed primarily for tracer lines, and small pieces of steam processing equipment. It comes in ½- and

¾-in. sizes and operates on a true balanced pressure principle. The trap has cast steel body and forged steel cover, with Monel bellows. Baffle is designed to deflect live steam upward, resulting in fast, snap-closed action, greater steam saving. Trap can be installed horizontally or vertically (in this position, it is claimed freeze-proof). W. H. Nicholson & Co.

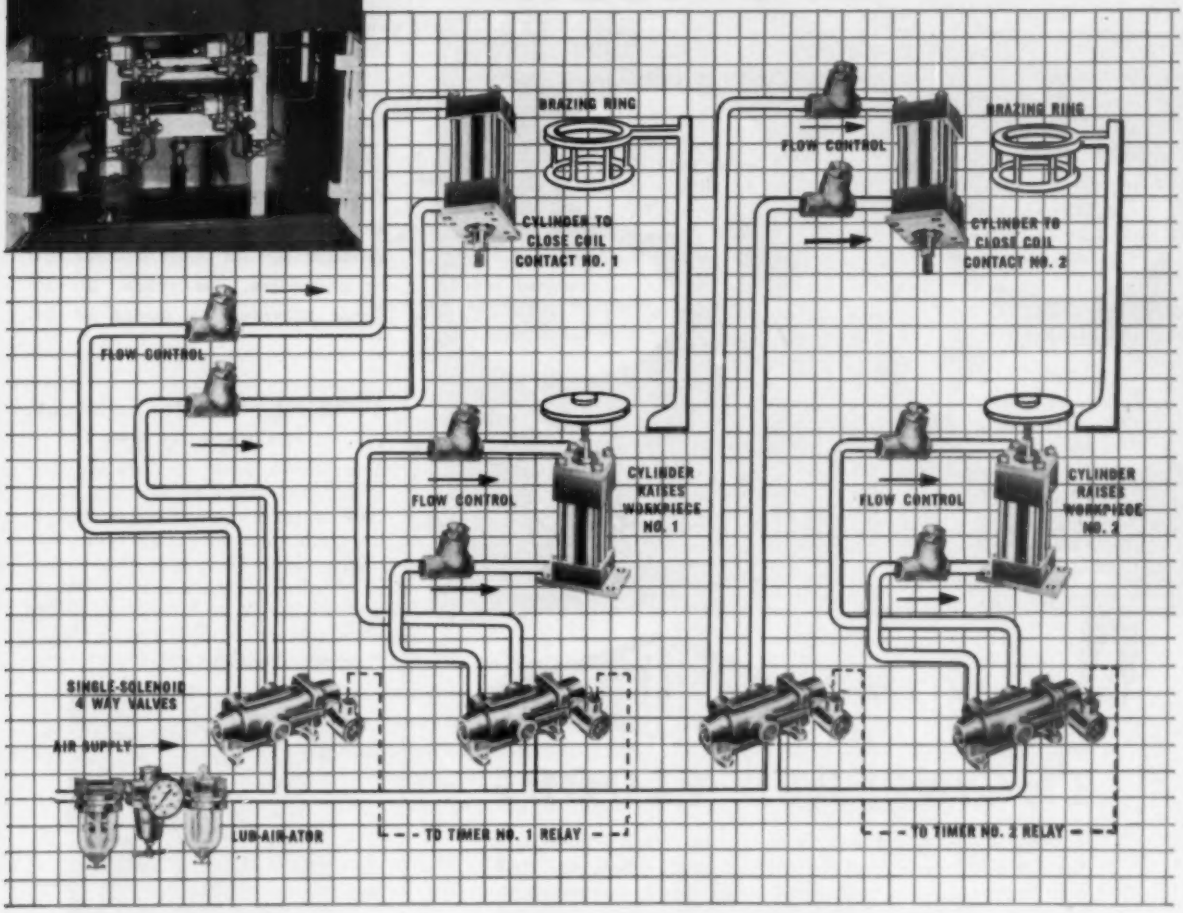
For details, circle 28 on Post Card

DUCT INSULATION offers strength, easy installation

Spun mineral fiber duct insulation—called E-Z Ply—is designed for greater rigidity and strength at no sacrifice in thermal insulating qualities. Between two and three times stronger and more rigid than company's previous insulation, its breaking strength exceeds 8 lb for 1-in. thickness 6 in. wide. Insulation is available plain or with following facings: Kraft paper vapor barrier bonded with asphalt; scrim-reinforced aluminum foil laminated with flame-proof Kraft paper; embossed aluminum foil; and Neoprene.



General Electric Company's Apparatus Service Shop in Detroit, Mich., uses Schrader air circuits to actuate and control this brazing machine. It enables one man to braze 120 planet carrier gear assemblies for automotive transmissions in one hour. Double-acting cylinders, actuated by solenoid valves, lift the assembly into position within the coil for brazing the shaft to the gear, and lower it for water quench. JIC cylinders control the induction heating coil contacts. According to Frank A. Ross, the designer, Schrader's Flow Control Valves close contacts so gently that they perform 750,000 cycles before needing replacement. In addition, air works successfully in a strong magnetic field, and the circuits can be simple.



TOUGH BRAZING JOB BECOMES A BREEZE... WITH SCHRADER AIR CIRCUITRY

PROBLEM: Strong magnetic field . . . complex movement of parts . . . speed requirements . . . precise actuation of coil contacts.

SOLUTION: Simple Schrader air control of mass production operations.

Schrader Air Products are designed to operate together in varied combinations to produce practically unlimited results. Their quality and versatility make them capable of *simplifying* production . . . while speeding it up . . . at unmatched low cost. Are you failing to ultilize fully the air you already have? Follow this Detroit plant's example. Examine your production facilities with air in mind. Make many operations simpler and more efficient by applying any or all of the complete line of Schrader Air Control Products.

FULL LINE OF QUALITY AIR CIRCUIT COMPONENTS • OFF-THE-SHELF SERVICE AND INFORMATION FROM YOUR NEARBY DISTRIBUTOR • STAFFED WITH AIR CIRCUIT EXPERTS • CONSULT YELLOW PAGES OR WRITE FOR HIS ADDRESS

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a division of SCOVILL

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Division of Scovill Manufacturing Co., Inc.
484 Vanderbilt Ave., Brooklyn 38, N. Y.

QUALITY AIR CONTROL PRODUCTS

Circle 599 on postcard, page 33

STOP COSTLY CORROSION DAMAGE...

CEILCOTE E-900
. . . dependable coating for severe corrosion service!
COROBOND
. . . acid-proof cement used with Ceilcote Brick!
CEILCRETE
. . . combined with glass cloth for extreme chemical resistance!
COROCRETE
. . . monolithic flooring four times stronger than concrete!
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WITH CEILCOTE

ENGINEERED FLOORS

Ceilcote *Engineered Floors* are the answer to costly floor maintenance problems caused by acid and alkali attack. And Ceilcote floors are engineered to withstand impact, thermal shock, abrasion and expansion without cracking or spalling! The installation shown above exemplifies Ceilcote's comprehensive approach to individual flooring problems . . . demonstrates how Ceilcote materials are carefully integrated to completely protect all types of surfaces. Working under contract, competent Ceilcote engineers analyze your operating conditions . . . formulate materials . . . direct surface preparation and installation by Ceilcote construction crews. Some installations can be installed under Ceilcote supervision or by plant personnel. *This complete flooring package with guaranteed performance is available only from Ceilcote!*

Write today or call your nearest Ceilcote Representative . . .

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Circle 600 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 152)

Thermal conductivity is 0.24 at mean temperature of 75 F, and maximum temperature limit is 450 F. It comes in 2-by-4 ft panels, 1, 1-½ and 2 in. thick. Light in weight and easily cut, it can be installed by conventional methods used for semi-rigid duct insulation. Baldwin-Ehret-Hill, Inc.

For details, circle 29 on Post Card

More information on any of these products can be yours without cost or obligation. Use reader Service Cards provided on pages 33--34.

TURBINE PUMP for high head, low capacity use

This turbine pump operates on pressure regeneration, by which a multivaned impeller engages and re-engages the liquid to develop high heads in a single stage. This regeneration cycle is repeated as many as 50 times as pressure it built up in the pump. When liquid reaches the discharge opening, it is allowed to escape and a close clearance stripper in the plates prevents the flow from continuing on to a suction area. This stripper lets the pump operate with large amounts of entrained gas, or vapor, which may have formed due to high vapor pressure of the liquid handled. A feature is replaceable casing plates. The pump is available as a close-coupled monobloc or frame mounted. Worthington Corp.

For details, circle 30 on Post Card

GALVANIZED COATING is applied like paint

Zinc Shield is 95 per cent zinc metal in liquid form; it is applied like paint and will withstand surface tempera-

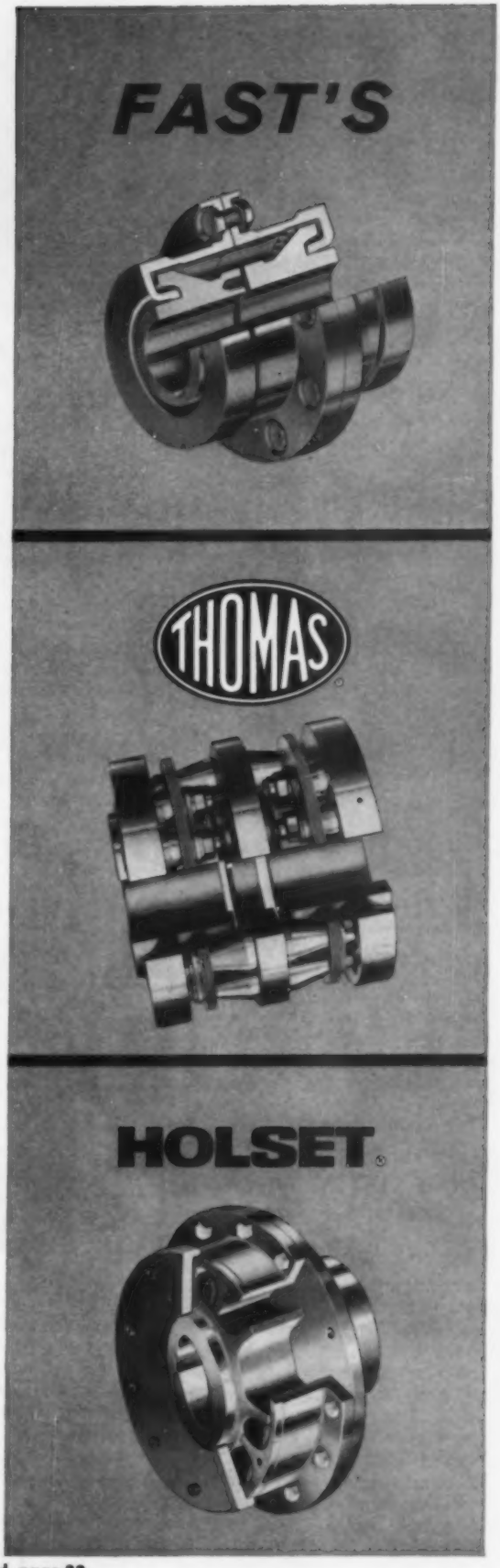
Three great names in couplings

NOW CARRY THIS CORPORATE SYMBOL

KOPPERS®

With the acquisition of the Thomas Flexible Disc Coupling line, Koppers now provides engineering solutions to a wide range of industrial coupling problems. Need a lubricated gear-type coupling for transmitting high loads? Koppers world-famous Fast's coupling line does the job on shafts up to 32 inches. Need a maintenance-free flexible-disc coupling with no backlash? The highly engineered Thomas line holds the answer—with miniature couplings as small as 1/12th of an ounce. Need a coupling to absorb impact or vibration? The Holset line of resilient, non-lubricated couplings protects equipment in most diesel, compressor and shock load applications.

Because each of these coupling lines has its particular application in industry . . . and because each is a recognized name in the power transmission field . . . you can continue to buy them by brand—just as you have in the past. Of considerable importance are the experienced, extensive engineering and manufacturing services of the entire Koppers organization that are available to help you with your power transmission problems . . . in any size, in any quantity, for any use.



KOPPERS COMPANY, INC.
COUPLING DEPARTMENT
Baltimore, Md. • Warren, Pa.
Engineered Products Sold with Service

Circle 601 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 152)

tures to 400 F. May be used as primer or tough finish coat to resist salt spray and corrosive fumes. Application to bare metal surface at 1200 sq ft/gal deposits ¼ oz of zinc metal coating. The Wilbur & Williams Co., Inc.

For details, circle 31 on Post Card

POWERFUL FLOODLIGHT uses quartz-iodine lamp

The Quartzlite 1500, newest of company's Intenso line, makes use of a 1500-w quartz-iodine lamp. It is said to give a full 22 lumens per watt throughout a 2000-hr life, which is

about 50 per cent greater output than that of a 1500-w PS 52 lamp. Its reflector design provides an unusually efficient beam pattern—wide horizontal distribution with sharp vertical cut-off to eliminate excessive spill light. The Quartzlite 1500 is 14¾ in. across, 9 in. high and 6⅞ in. deep; it weighs 19 lb. with pole fitter. Bulletin QL 15-161 describes it. Appleton Electric Co.

For details, circle 32 on Post Card

JOINT SYSTEM TAPE for use in drywall construction

Primary advantage of Embossed Tape is that it can remain stable under varying humidity conditions, thus reducing uneven expansion and edge wrinkling—contributing factors in edge cracking of finished walls and ceilings. Other advantages include easier application, rapid drying with no air retention, and superior adhesion to wallboard surfaces. Based on concept of porosity without holes, tape is center embossed to permit air flow through roll of tape, and edge embossed to take up stretch in the skiving operation. Bestwall Gypsum Co.

For details, circle 33 on Post Card

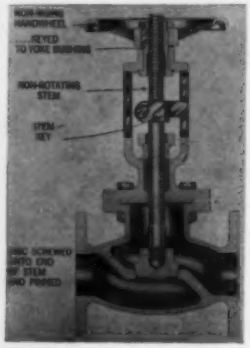
CORRUGATED PANEL in flexible continuous rolls

Rololite comes in continuous rolls for use in skylightes, roofing, fencing, window walls, partitions, etc. Continuous length and extra width of the translucent fiber glass panel eliminates overlap and cutting wastes, saves installation time, minimizes use of nails, mastics. One 40-by-50 in. roll covers over 166 sq ft. Material can be formed into circles, angles, curves; may be sawed, drilled, nailed. It nestles with 2½-in. corrugated roofing, siding. Auburn Plastic Engineering Co.

For details, circle 34 on Post Card

GLOBE VALVES feature basic design improvements

Closer throttling control and elimination of disc vibration and chatter are announced for these re-designed globe-type valves. Previous models had a rotating stem with rising handwheel and swivel disc; the new valves have a



non-rotating stem with non-rising handwheel and fixed disc. This change is claimed to eliminate three disadvantages of conventional globe valves, in 2-in. sizes and over; stem vibration and disc chatter; galling between stem foot and disc; and the tendency of the conventional-type stem to cut a spiral through the packing, which can cause excess leakage. Improved throttling control is possible because the "key" that prevents stem rotation is fitted into a slot in the bonnet yoke. Since this key moves in relation to the yoke, it is

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RAPID CITY, S. D., Robbins & Stearns Wholesale
RED BANK, N. J., Altex Pipe & Supply Co.
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Cut installation costs up to 50%

with G-B SNAP*ON®

Simply spread G-B Snap*On open at the seam, slip over the pipe and let it snap shut—that's how easy it is to cut installation time in half with G-B Snap*On. The highly resilient glass fiber construction of this one-piece pipe insulation (in sections up to 6′ in length and up to 36″ IPS) insures a snug fit with the seams tightly butted together.

G-B Snap*On's ability to provide maximum protection against heat loss or gain is second to none among all general purpose pipe insulations. In fact, G-B Snap*On requires less insulation thickness than most other pipe coverings to provide the same insulating efficiency. Any way you look at it, you save time and money with G-B Snap*On.

WRITE FOR COMPLETE INFORMATION TODAY.

GUSTIN-BACON *Manufacturing Company* gb

232 W. 10th St., Kansas City, Missouri

Thermal and acoustical glass fiber insulations . . . Molded glass fiber pipe insulation . . . Couplings and fittings for plain and grooved end pipe

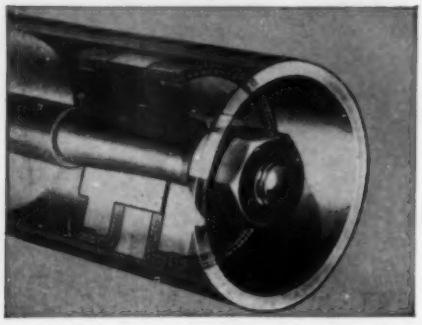
Circle 602 on postcard, page 33

PUMCUPS

outlast ordinary packings

3 TO 1

- *in hydraulic and pneumatic mechanisms*
- *in reciprocating pumps*



With Darcova Pumcups...regardless of wear, pressure keeps Pumcups hugging cylinder wall.

Operating costs go down and efficiency goes up when Darcova Pumcups go in! Here's why:

- **Pumcups outlast other packings at least 3 to 1, based on actual reports from users**
- **Fluid slippage is virtually eliminated, because Pumcups operate at full efficiency throughout their entire life**
- **Maintenance costs are reduced, because you have fewer replacements, less downtime.**

Available in three textures—hard, medium and soft. Also in regular or 100% nylon composition. Size ranges from ¾" to 20". For *all* the facts on Darcova Pumcups, write for Bulletin 5903.

DARLING VALVE & MANUFACTURING CO.
Williamsport 14, Pa.

DARCOVA — THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

Circle 603 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 152)

possible to calibrate the yoke in terms of the degree of throttling desired. Now available in the new design are 150-lb globe, angle and Y valves in 2-in. sizes and larger, in corrosion-resistant alloys for application in chemical, food, petroleum and other proccessing industries. Alloy Steel Products Co.

For details, circle 35 on Post Card

AIR-COOLED CONDENSERS for roof or ground level

The BUVH series of air-cooled condensers, for industrial air conditioning, includes models for horizontal and vertical air flow, ratings from 20 to 60

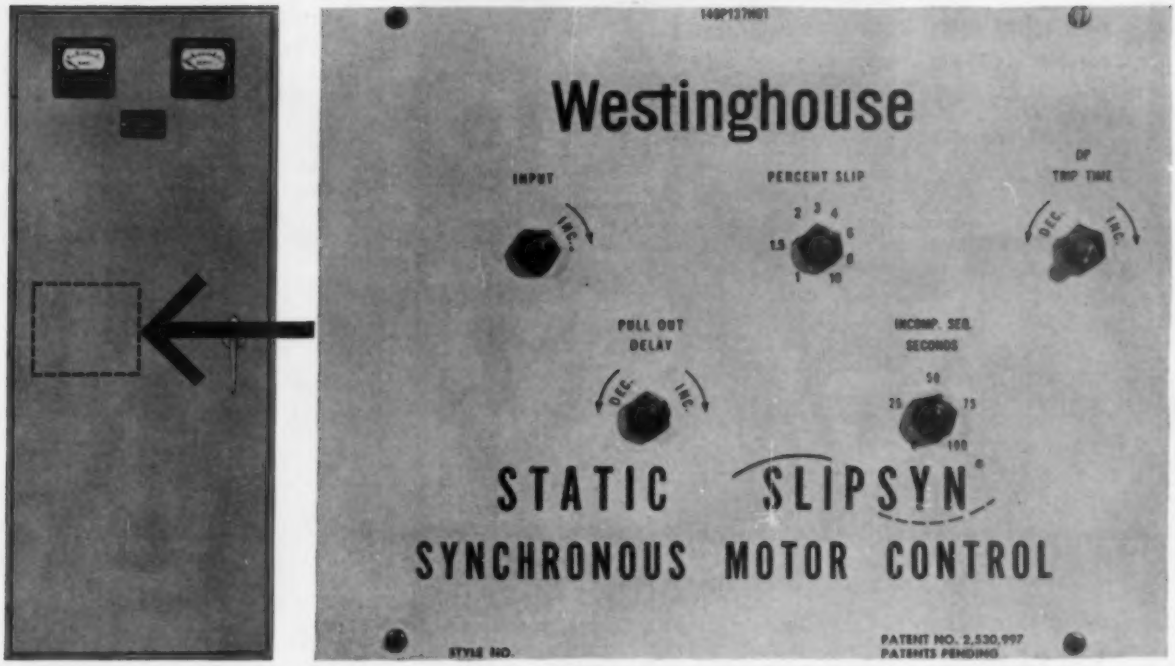
tons. The units are designed for roof top or ground level installation, can be used with manufacturer's Type CLS compressors. Inner-fin-coil construction of these condensers permits a new compact size, and by reducing the internal volume of the condenser, less refrigerant charge is required. The coil is designed to assure low static pressure drop with less fan horsepower and lower operating costs. Westinghouse Electric Corp.

For details, circle 36 on Post Card

PRIMER can be used on damp concrete floors

Penntrowel Damp Surface Primer makes possible installation of floor coatings without long drying time. It helps assure firm bonding in many cases where surfaces are believed dry, but actually contain some moisture. It can be applied with a stiff brush after normal cleaning. This primer is a two-component, semi-viscous amber liquid with bonding strength greater than concrete, brick or wood. Compatible with other Penntrowel resin products, it resists acids, alkalis, oils and solvents and offers good thermal shock resistance. A gallon covers 100 to 150 sq

Now... Westinghouse Static Slipsyn* Control includes 3 more static protective features for synchronous motors



1. **STATIC DAMPER WINDING NETWORK** protects synchronous motors against damage by locked rotor or excessively-long starting conditions. This circuit may be quickly and easily added to your present static units.

2. **STATIC FIELD LOSS NETWORK** protects motors against abnormal conditions resulting from loss of d-c excitation.

3. **STATIC INCOMPLETE SEQUENCE NETWORK** protects the motor in case it fails to sequence properly during start up.

These features, added to the basic Westinghouse exclusive Static Slipsyn control make Static Slipsyn more than ever, the best control available. Its advantages:

Most accurate synchronization system available—accuracy up to 99% of synchronous speeds — not affected by machine vibrations.

Adjustable pull-out protection—eliminates nuisance tripping due to transient conditions — easily adjusts from the front — can be set to re-synchronize or shutdown on actual pullout.

No maintenance — completely static transistorized synchronizing system — uses no moving parts — components are impervious to humid, corrosive or dirty atmospheres — there are no relays to burn, pit, inspect or repair.

Applicable to all synchronous motor starters—same sized package for all applications — for both high and low voltage — whether for new motor installation or for relay replacement.

For additional information on the advantages of Static Slipsyn Control for synchronous motors in *all* manufacturing operations, call your local Westinghouse sales engineer or write to: Westinghouse Electric Corporation, General Purpose Control Department, P.O. Box 2025, Buffalo 5, New York.

You can be sure...if it's **Westinghouse**

*Trademark

J-28011

Circle 604 on postcard, page 33

Clarke
POWER SWEEPERS

Walking Type power sweepers in 27" and 36" swath sizes. Riding sulky available for 36" size.

Riding Type sweeps 36" swath, is easily maneuvered, even in congested areas.

Heavy Duty Riding Type sweeps 36" swath, is built like a tank for 'round the clock use.

CUT SWEEPING COSTS UP TO 80%

These rugged workhorses will outstrip twenty men with pushbrooms in sweeping large floor areas! They cover from 35,000 to 100,000 sq. ft. per hour, sweeping right up to the walls, picking up all debris and dust. Available in walking, sulky and riding types to reduce your sweeping costs as much as 80% . . . *give you labor costs as low as 15c per hour!*

For a demonstration on *your* floors, write for full details and name of your nearest Clarke Power Sweeper distributor.

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FLOOR MACHINE COMPANY
DIVISION OF STUDEBAKER-PACKARD

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Distributed by: Rudel Machinery Company Limited, Montreal 3, Quebec

Circle 605 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

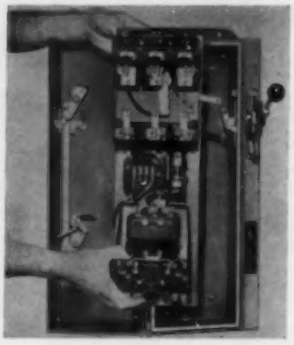
(Begins on page 152)

ft, depending on roughness of surface. It is stable in storage for long periods. Pennsalt Chemicals Corp.

For details, circle 37 on Post Card

COMBINATION STARTER has multiple-step interlocking

Designed to meet NEMA-12 (industrial) and NEMA-5 (dust-tight) standards, this fusible safety combination starter is available with Size 0, 1 or 2 contactors and 30- or 60-amp diconnects. Additional optionals offered include third-line overload protection, dual control-circuit fusing, and extra transformer capacity. The disconnect



switch features a visible-blade design, silver-alloy contacts, snap-action operation, and interchangeable fuse clips. Maximum operator protection is provided by multiple-step interlocking design of enclosure door latch and disconnect switch. To assure dust-tight operation, the door latch is designed to prevent turning the disconnect switch "on" until the door is completely closed and fully latched. Complete starter unit can be removed from or reinstalled in the enclosure, since no disassembly of the disconnect operator mechanism is necessary. Disconnect and starter are mounted on a heavy gage sheet metal plate. The Clark Controller Co.

For details, circle 38 on Post Card

BASIC CIRCUIT BLOCKS for machine control

Twelve basic circuit blocks for industrial machine control and other applications requiring logic functions are announced as featuring high reliability. Each block consists of one or two basic logic circuits performing specific functions, such as: flip-flop, pulse shaper, gate circuits, inverter amplifier, emitter followers etc. Individual components

POWELL PERFORMANCE PAYS OFF

Any way you look at it, Powell performance really pays off. Take "availability" for instance.

You'll find that Powell makes just about any type of valve you may need—for oil, water, gas, steam, air and corrosive fluid applications. The same holds true for virtually any temperature and pressure. What's more, you'll find Powell valves are available in industry's widest selection of bronze, iron, steel and special alloys—from aluminum to zirconium. (The fact is, Powell pioneered application of special alloys in valve design.)

In short, you'll find Powell performance also includes outstanding availability—of exactly the type valve you need. And, since Powell maintains large stocks both at the factory and key points across the country—you get exactly what you need, when you need it. For further information, contact your nearby Powell Valve distributor or write The Wm. Powell Co., Cincinnati 22, Ohio.

175-pound W.O.G. Semi-Steel flanged and Lubricated Plug Valve. Wrench operated. Sizes 1" through 4". Available also with screwed ends. Catalog of complete line on request.

125-pound All Iron Gate Valve. Outside screw rising stem and yoke. Flanged ends, 2" through 30". Screwed ends, ¼" through 8". Iron body bronze mounted valves also available.

125-pound Iron Body Bronze Mounted Swing Check Valve. Bolted flanged cap. Can be used in either horizontal or vertical position. Sizes, flanged, 2" through 18"; screwed, 2" through 4". Can also be furnished in all iron.

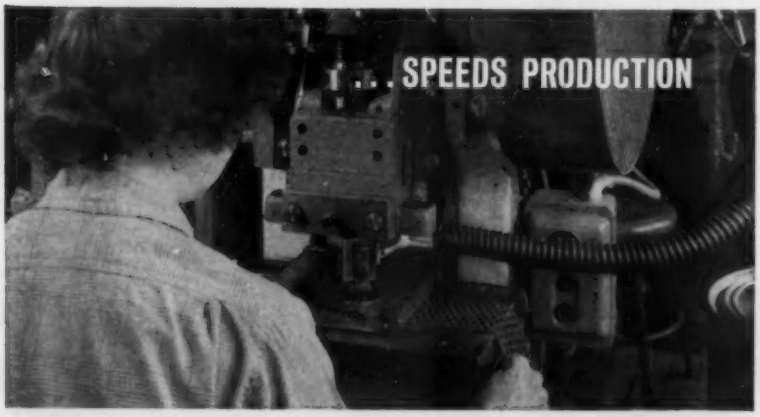
115th year of manufacturing industrial valves for the free world

POWELL DEPENDABLE VALVES

THE WM. POWELL COMPANY CINCINNATI 22, OHIO

Circle 606 on postcard, page 33

Here, DOUBLE DUTY Use of a SPENCER VACUUM SYSTEM



At Charles W. House & Sons, Inc., Unionville, Connecticut, a single Spencer vacuum system contributes to plant efficiency and operating economy in two important ways, by:

SPEEDING PRODUCTION—At the machines where washers are stamped from felt strip, vacuum picks up the washers, conveys them to containers and carries off the fuzz and dust—leaving washers **clean.**

SIMPLIFYING MAINTENANCE—Cleaning is quick and thorough with Spencer vacuum. And because dirt and litter is carried off through an enclosed piping system, there's no hazardous, unhealthful recirculation of dust or lint.

For a no-obligation analysis and suggestions on how Spencer vacuum may be able to meet **your** production, conveying or maintenance needs, write outlining your particular problems.

Request Catalogs No. 155B "Spencer Vacuum", and No. 143-B "Pneumatic Conveying".

The **SPENCER** TURBINE COMPANY
HARTFORD 6, CONNECTICUT

Circle 607 on postcard, page 33

PLANT ENGINEERING EQUIPMENT

(Begins on page 152)

of the blocks are mounted on a printed wiring board, placed in a synthetic resin case, and encapsulated. Blocks are color coded for recognition of circuit function. Amperex Electronic Corp.

For details, circle 39 on Post Card

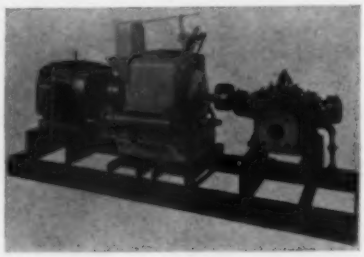
EMERGENCY LIGHT for outdoor applications

Electrical components in the Light Warden 300 Series are hermetically sealed against moisture, dust or corrosion for outdoor applications. Rubber gasketed throughout, the rugged units feature corrosite finish, have a battery choice with capacities from 40 to 105 amp-hr. They are self-charging, operating from regular house current, with high rate charge for restoring energy after use, and trickle charge to maintain energy level. Electric Cord Co.

For details, circle 40 on Post Card

PUMPING UNIT solves pressure-volume problems

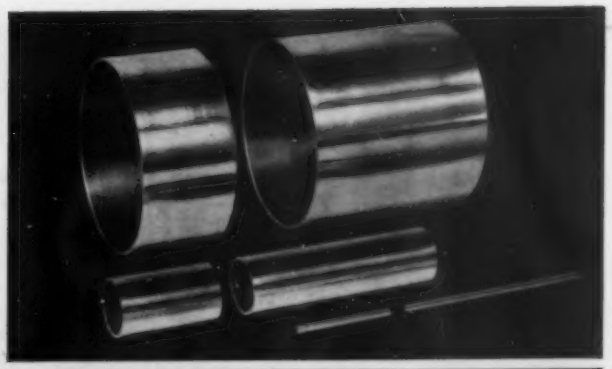
Accupressure is a compact pumping system for maintaining constant water pressure within 1½ to 2 per cent limit despite varying demand. It is intended for use in buildings where large volume and constant pressure are required but where demand varies, and it replaces roof and basement pressure

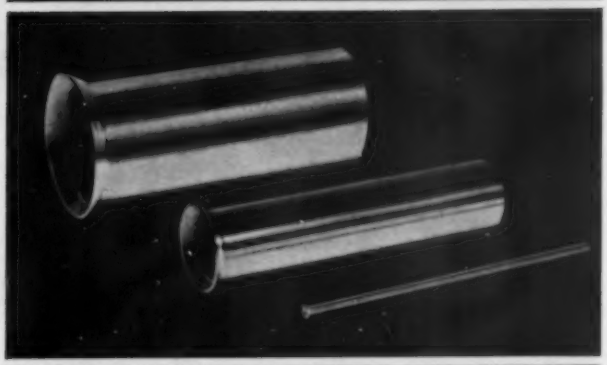


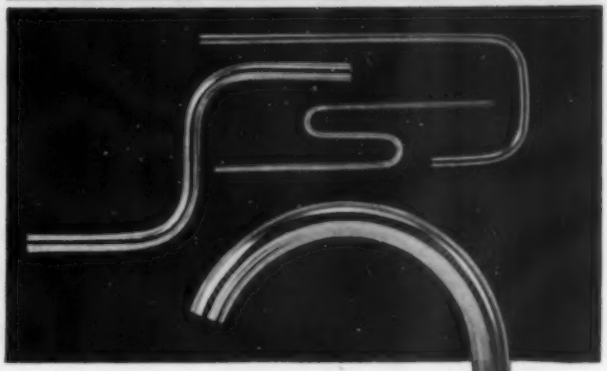
tanks. The unit consists of a centrifugal pump (Type S or KS), a constant speed motor and a fluid drive control, a pressure sensing device which governs depth of a scoop tube on the fluid drive. This action raises or lowers speed of output shaft to the pump. Manufacturer claims that when properly applied and adjusted the bhp requirements of the unit will never exceed that required on the curve at the design point. Maintenance is limited to normal bearing and packing inspection and without air in the system corrosion problems are eliminated. Allis-Chalmers Mfg. Co.

For details, circle 41 on Post Card

CUTTING
FLARING
BENDING







only Imperial-Eastman offers every tool you need for your best tube circuitry

Here's why: Imperial-Eastman offers the right tool for every purpose—cutting, flaring, bending, deburring, reaming, swaging, sizing, refacing. It's the most complete line in the industry. No matter what fitting or tube *size* you work with (from ⅛" to 4⅛") there's an Imperial-Eastman tool for the job. Every Imperial-Eastman tool is *job-matched* to perform highest quality work at maximum efficiency. Every one is *precision-engineered* to deliver maximum performance.

To be sure *your* tube circuitry is always at its best, insist on Imperial-Eastman tubing tools. Write for Catalog 3121.

IMPERIAL EASTMAN

Imperial-Eastman Corporation General Offices: 6300 West Howard Street, Chicago 48, Illinois

Imperial-Eastman Corporation (Canada) Ltd., Barrie, Ontario • Imperial-Eastman, S.A., Apartado Postal 26544, Mexico 13, D.F.

Circle 608 on postcard, page 33

DATA FILE OF LITERATURE FOR THE PLANT ENGINEER'S LIBRARY

STANDARD CATALOGS, bulletins and handbooks are described here to help plant engineers maintain a permanent data file. To order this free literature, use Reader Service Cards provided for you on pages 33-34.

PUMPS, COMPRESSORS

Centrifugal Pumps

Applications and features of centrifugal pumps for boiler feed, processing, drainage, washer and booster service are detailed in 8-pp File 1440-A. Construction details, dimensions, selection chart and fitting data given. Dunham-Bush, Inc.

For a copy, circle 301 on Post Card

Close-Coupled Single Suction Pumps

Mechanical, hydraulic and application data is featured in Bulletin 975-G, 24 pp, on close-coupled single suction pumps—special small, small, medium, large and oversize. Parts list included. Buffalo Pumps Div., Buffalo Forge Co.

For a copy, circle 303 on Post Card

Cooling Tower Pump Guide

Bulletin CT-360, 8-pp, is a six-step guide for planning pump and piping requirements of cooling tower installations. Covers amount of water to be circulated; layout of piping system; static head and pressure drop; pump selection; pipe sizing. Bell & Gossett Co.

For a copy, circle 304 on Post Card

Packaged Compressor Stations

Operational and design features of packaged compressor stations for gas lift, repressuring, recycling, plant feeders, refining, gas transmission, multi-service and other applications are covered in Bulletin 191, 6-pp. Clark Bros. Co.

For a copy, circle 305 on Post Card

Rotary Air Products

Performance curves and engineering tables along with data on features and advantages of rotary air products, including air motors, air compressors, vacuum pumps given in 12-pp Catalog 660. Gast Mfg. Corp.

For a copy, circle 307 on Post Card

Feather Valve Compressors

Installation advantages, operation and maintenance details for YC and DYC feather valve compressors, from 75 to 350 hp, are outlined in 32-pp Bulletin 3620-BI. Worthington Corp.

For a copy, circle 308 on Post Card

Heavy Duty Air Compressors

Performance details and basic construction features of heavy duty air compressors for continuous operation are detailed in 36-pp Bulletin A-43. Data tables and fold-out drawings included. Joy Mfg. Co.

For a copy, circle 309 on Post Card

Compressors for Industrial Use

Design features and applications of unit type to 15 hp and stationary type to 100 hp compressors are detailed in this Bulletin SG 3. Le Roi Div., Westinghouse Air Brake Co.

For a copy, circle 310 on Post Card

The Compressor Valve Story

Operation and importance of valves in modern reciprocating compressors are described in 44-pp Form 3222. Question-and-answer format details demands made on valves and their function in a compressor. Booklet traces evolution of valving from 18th century. Ingersoll-Rand Co.

For a copy, circle 311 on Post Card

PACKINGS, GASKETS, SEALS

Mechanical Packings

Featured in 24-pp Catalog 60 are multi-purpose Bel-Vee V-ring packings, criss-cross braid packing, twisted foil packings, for oil and distillate temperatures to 1000 F. The Belmont Packing & Rubber Co.

For a copy, circle 313 on Post Card

Piston Packing Data

Sixteen-pp Bulletin 5903 presents engineering data on Darcova Pumpcups for packing pistons of air and hydraulic cylinders, and reciprocating pumps. Darling Valve & Mfg. Co.

For a copy, circle 314 on Post Card

Industrial Mechanical Seals

Performance and design features of Mechanipak PK mechanical seals for a variety of operating conditions are detailed in 8-pp Bulletin AD-150. Garlock, Inc.

For a copy, circle 315 on Post Card

Internal Mechanical Seals

Bulletin CP-575 features internal seals suggested for use at pressures from 28-in. Hg vacuum to 100 psi and from −80 to 500 F. Chemical & Power Products, Inc.

For a copy, circle 316 on Post Card

MECHANICAL POWER TRANSMISSION

Adjustable Speed Drives

Bulletin 2900, 6-pp, describes four types of packaged adjustable speed drives and gives details on ratings, speed ranges, type enclosures, associated controls and modifications. The Louis Allis Co.

For a copy, circle 318 on Post Card

Adjustable Speed Fluid Drives

Bulletin 9819, 8-pp, describes adjustable speed Gyrol fluid drives, 1- to 25-hp, giving advantages, applications, components and operation. Industrial Div., American-Standard.

For a copy, circle 319 on Post Card

Flexible Cushion Couplings

Two new types of Para-flex couplings —one for high speed, high torque use and another for flywheels of internal combustion engines—are described in 20-pp Bulletin 901A along with the standard Para-flex. Engineering data, photos included. Dodge Mfg. Corp.

For a copy, circle 321 on Post Card

Heavy-Duty Couplings

Catalog 70, 12-pp, contains engineering and application data on dihedral spindle shaft couplings for mills and allied equipment for metal, paper, rubber, chemical, food industries. Ajax Flexible Coupling Co., Inc.

For a copy, circle 322 on Post Card

Couplings for Electric Motors

Folder 2975, 6-pp, describes low cost geared flexible couplings designed for transmitting power to pumps, compressors, generators, speed reducers etc. Link-Belt Co.

For a copy, circle 323 on Post Card

Controlled Tensioning

Bulletin 4161 tells how use of drive tensioner eliminates shock loading through excessive chain vibration, and horsepower loss through belt slippage. Brewer Machine & Gear Co.

For a copy, circle 325 on Post Card

Anti-Friction Bearings

Catalog 424-D, 8-pp, gives capsule presentation of company's line of anti-friction bearings, describing each product. SKF Industries, Inc.

For a copy, circle 326 on Post Card

Industrial Rubber Products Guide

Bulletin BHM-10, 40-pp, describes such rubber products as V-belts and sheaves, V-belting and flat belts, hose and couplings, rubber lined products and molded rubber goods. Dimensional tables, hose selector guide provided. The Gates Rubber Co.

For a copy, circle 328 on Post Card

HEATING, VENTILATING

Industrial Unit Heaters

Direct-fired, vertical delivery unit heaters, designed to solve heating problems in commercial and industrial buildings, are covered in 6-pp Bulletin IGV-660. Modine Mfg. Co.

For a copy, circle 330 on Post Card

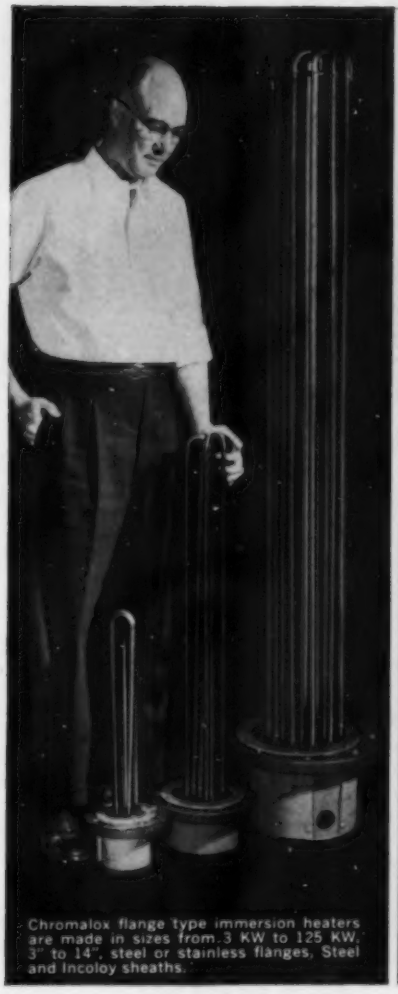
Heater Test Code

Presented in 22-pp Bulletin 20 is a revised code for testing propeller-type steam unit heaters. Establishes uniform methods for tests on heaters using dry steam as heating medium and serves as a standard for developing performance ratings. Air Moving & Conditioning Ass'n, Inc.

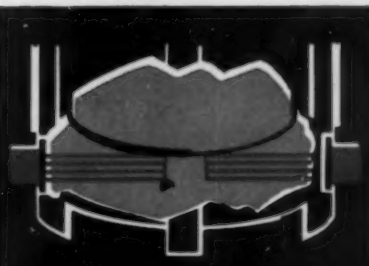
For a copy, circle 332 on Post Card

CHROMALOX Flange-Type ELECTRIC IMMERSION HEATERS

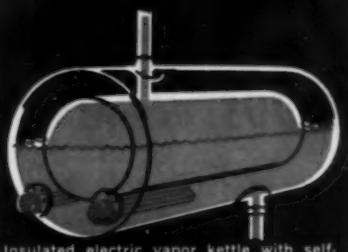
Fast, Uniform, Leak-Proof Heating for water, hard-to-contain liquids and gases



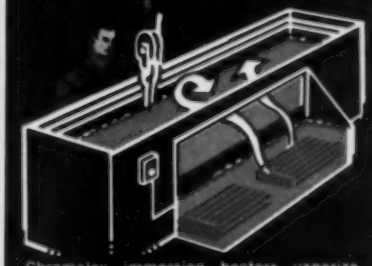
Chromalox flange type immersion heaters are made in sizes from .3 KW to 125 KW, 3" to 14", steel or stainless flanges, Steel and Incoloy sheaths.



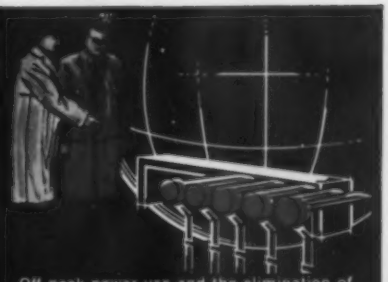
Heaters, mounted into jacketed kettles, give uniform and accurately controlled heat transfer for critical resin processing.



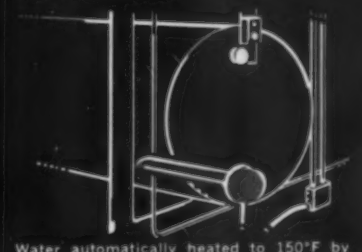
Insulated electric vapor kettle with self-contained heat transfer medium gives fast, uniform, controlled heat up to 700°F.



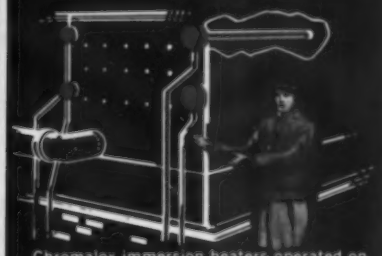
Chromalox immersion heaters vaporize trichlorethylene in side tank; vapors circulate into main tank where they efficiently degrease metal soils.



Off-peak power use and the elimination of boiler, building, and smokestack more than pay off when immersion heaters mounted in storage tank, heat water to required 180°F temperatures.



Water automatically heated to 150°F by Chromalox heaters eliminates oil storage tanks, burners and maintenance; assures hot water for washrooms and other needs.



Chromalox immersion heaters operated on off peak rate "freeze-proof" water supply in plant's boilers on cold winter nights and weekend shutdowns.

Chromalox Flange-Type Electric Immersion Heaters are quick, easy and economical solutions to heating compressed air and other gases, for super-heating steam and for heating liquids of all types, including Dowtherm, Arclor, Prestone and similar heat transfer mediums. They are particularly well adapted to special high-temperature/high-pressure applications and for use in corrosive solutions. The relatively small displacement of the heaters and their high outputs, make them ideal for large volume heating with minimum work-area interference with the tank and minimum impedance to the flow of fluids. Standard heaters furnished with 150 psi flanges, special flanges withstand up to 4500 psi.

GET THE FACTS

See for yourself how Chromalox Immersion Heaters can help improve efficiency and/or decrease costs. Write for Catalog 60 and Industrial Process Bulletins.

EDWIN L. WIEGAND COMPANY
7553 THOMAS BLVD., PITTSBURGH 8, PA.

WI-21

CHROMALOX
FIRST NAME IN ELECTRIC HEAT

CHROMALOX ELECTRIC HEAT

PROCESS — COMFORT

Circle 609 on postcard, page 33

Another case history on TORIT Dust Collectors

"THE GRIEVANCE COMMITTEE IS HERE ...ABOUT THAT DUST AGAIN!"

"This was the third time in a month that the grievance committee had complained about the dust in the shop. And this time they wanted to know what I intended to do about it.

"Frankly, I was on the spot. Oh, not that I blamed the workers. I knew the shop was dirty. How could it be anything else with grinding machines running 16 hours a day? And I was as unhappy about the situation as the employees were. Poor employee morale was serious enough—and absenteeism, machine wear, misalignment and down time caused by dust was costing plenty.

"Then I remembered a salesman with a dust collecting machine system had called on me a few months back. I dug his card out of the file and found he was from the Torit Company. I got him in pronto—and I bought one of his Model 90 Cabinet machines for less than $1,000. It services four surface grinders and it really performs. A month later I had Torit Dust Collectors installed for the rest of the machines.

"Torit Dust Collectors have practically eliminated the dust in our shop. And you can imagine the effect this has had on employee morale. People are happier and healthier. Absenteeism is no longer a problem and our production rate is higher than ever."

Cabinet Model 90

Torit can solve your dust problems. For complete facts on dust . . . and how to control it . . . write

TORIT manufacturing company

1831 Rankin St., St. Paul 16, Minn., Dept. 1831

Circle 610 on postcard, page 33

DATA FILE

(Begins on page 178)

For Controlled Heating

Bulletins CS300-A, CS301-A and CS-302-A explains how to get perfect, controlled heating comfort without ducts, blowers or heat exchangers with infra-red gas heaters. The four-rayhead infra-red heater (48,000 Btu/hr) and the two-rayhead infra-red heater (24,000 Btu/hr) are featured with engineering data. Perfection Div., Hupp Corp.

For a copy, circle 334 on Post Card

Industrial Heater Guide

Descriptions, technical data and application photos on combination oil/gas industrial heaters are contained in 12-pp bulletin. Performance charts, dimensions, capacities, horsepower, diagrams and plumbing data included. Lennox Industries Inc.

For a copy, circle 336 on Post Card

Power Roof Ventilators

Bulletin DB3-200, 8-pp, features Type L-CRF centrifugal power roof ventilators for exhaust applications up to 2 in. static pressure. Includes data on four larger sizes with capacities to 27,290 cfm. Describes the backward curved Air-foil design blades, direct-connected drive, motors. Ilg Electric Ventilating Co.

For a copy, circle 337 on Post Card

Efficient Roof Ventilators

Engineering data on roof ventilators, fans and blowers—including the Vertijet, automatic Airjet, reversible, mushroom head and stack cap types—is presented in 16-pp Bulletin A-112E. Hartzell Propeller Fan Co.

For a copy, circle 338 on Post Card

Air Moving Equipment

Bulletin DB-45, 20-pp, contains data on roof ventilators, bifurcators, axial flow vent sets, and air jets with ratings. DeBothezat Fans Div., American Machine and Metals, Inc.

For a copy, circle 340 on Post Card

Industrial Exhaust Fans

Featured in 16-pp Catalog 707 is a line of exhausters with cast iron housings and side-plates for a wide range of services. Performance tables included. Clarage Fan Co.

For a copy, circle 342 on Post Card

Industrial Exhausters

Three types of industrial exhausters—material handling, air handling and open wheel—are detailed in 32-pp Bulletin FI-110-B. Design, construction, performance, capacity ratings and dimension data given. Buffalo Forge Co.

For a copy, circle 343 on Post Card

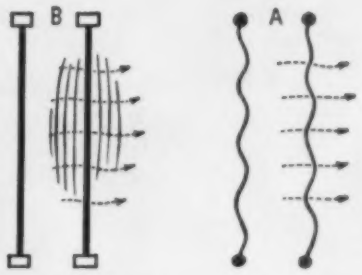
DUST, FUME CONTROL

Dust Control Systems

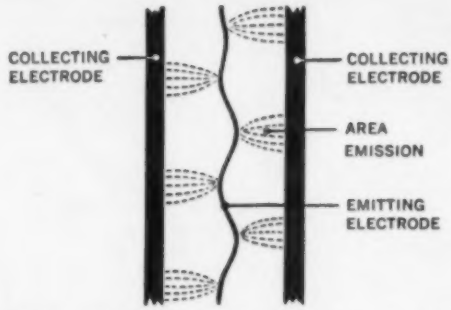
Bulletin 104, 36-pp, on dust filters, gives information on dust control

SUPERIOR PRECIPITATOR PERFORMANCE

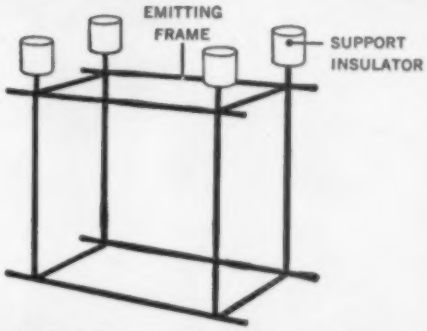
– how it's helped by Buell's exclusive emitting system



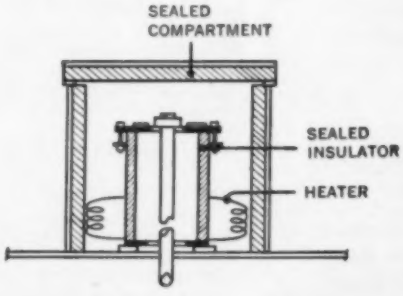
LESS THAN 2% REPLACEMENT – Each stainless steel Buell Spiralectrode is firmly fixed top and bottom to a rigid frame (A). Self-tensioned in this way, the electrode does not sway or lose alignment as shown at (B), even under current surges or varying gas flows. Buell's 10-year replacement record in this critical area is under 2%.



HIGHEST EMISSION – TOP EFFICIENCY – The patented spiral shape of emitting electrodes in the Buell precipitator presents collectors with areas of maximum emission per unit of power input. Because there is no problem of efficiency-destroying misalignment here, you can apply maximum voltage to achieve peak emission.



RUGGED SUSPENSION – Buell SF Electric Precipitators are designed and built to take extremely rugged operating conditions. The emitting frame is constructed of heavy-gauge steel and the whole unit is held rigid by four supporting insulators. Because of this rigid box-type construction, misalignment or arcing is not a problem.



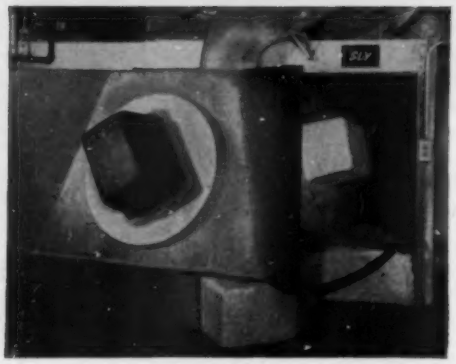
QUARTZ INSULATORS – SEALED COMPARTMENTS – Special temperature- and shock-resistant quartz insulators are sealed in individual compartments. This prevents circulation of dirty gas from the precipitator, without the need for costly ventilating systems. Thermostatically controlled heaters prevent condensation during start-up.

. . . and don't forget the simple, effective, mechanical rapping system, possible only because rugged Buell construction permits electrodes to be so rigidly mounted. Other features: Buell's advanced collecting electrode design . . . adjustable baffles. No wonder you're sure to be pleased with Buell's superior performance, minimum maintenance!

Buell Engineering Co., Inc., Department G, 123 William Street, New York 38, New York. Electric Precipitators · Cyclones · Bag Collectors · Combination Systems · Classifiers · Fans. Member Industrial Gas Cleaning Institute

buell Norblo

Circle 611 on postcard, page 33



Operator (at right) applies fiber glass-binder mix to preform screen. Helper is removing cured preform which has just come out of oven.

Newly made preform travels into first curing zone as empty screen moves to application station.

NEW FIBER GLASS PREFORMER-CURING OVEN

WORK ROTATES... PRODUCTION IS DOUBLED

With Sly's new Preformer-Curing Oven, Plastic Products Corporation, Bedford Heights, Ohio, produces finished fiber glass preforms on the average of *one a minute*. Production rate of the preformed shapes, which are used as reinforcement in a range of plastic products, is twice that of the previous method.

Sly design insures a better product as far as both curing and shape retention are concerned. Heavy manual labor is eliminated. And the installation takes up a space that is only 11 feet square.

Sly has applied the principle of the familiar revolving door to make all operations continuous. At the application station the fiber glass-binder mixture is sprayed onto the preform screen. The newly made preform is then rotated successively to the first curing chamber, the second curing chamber, and finally the unload station.

Sly designs ovens for every need. Send us your requirements. Put our experience to work for you. And write for Bulletin 200.

THE W.W. SLY MANUFACTURING CO.
4600 Train Avenue • Cleveland 1, Ohio • Offices in Principal Cities

Circle 612 on postcard, page 33

DATA FILE

(Begins on page 178)

systems and how to engineer them. Describes the Roll-Clean Dynaclone dust filter. The W. W. Sly Mfg. Co.

For a copy, circle 345 on Post Card

Cabinet Dust Collectors

Self-contained cloth-filter type dust collectors are described in 6-pp Bulletin 359. Torit Mfg. Co.

For a copy, circle 347 on Post Card

CONSTRUCTION

Lightweight Steel Piling

Piling for light load excavations is described in Catalog 593 with typical installation illustrated and advantages detailed. L. B. Foster Co.

For a copy, circle 349 on Post Card

Steel Joist Construction

Standard and long span open web steel joists are illustrated in this 38-pp catalog. Advantages, design and properties of the construction are detailed. American Bridge Div., United States Steel Corp.

For a copy, circle 352 on Post Card

Structural Clay Products

Descriptive information and construction details on structural clay building materials are given in 24-pp Catalog S-61. Characteristics and advantages of facing tile, bricks, other products, are detailed. Natco Corp.

For a copy, circle 353 on Post Card

Basic-Roofing Information

"What You Should Know About Your Roof" is a 40-pp booklet telling what makes a roof fail, how to recognize roof deterioration and what to do to keep a roof in good condition. Johns-Manville Corp.

For a copy, circle 354 on Post Card

Cold Storage Doors

Advantages of Electroglide electric horizontal sliding doors for cooler and freezer operation are detailed in this 6-pp bulletin. Includes table of sizes, installation data. Jamison Cold Storage Door Co.

For a copy, circle 355 on Post Card

Acrylic Plastic Sheet

Properties and characteristics of Plexiglas acrylic plastic sheet are detailed in 12-pp Booklet PL-415. Industrial uses shown. Rohm & Haas Co.

For a copy, circle 356 on Post Card

Non-Slip Steel Flooring

Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of 8-pp Booklet AL-29. Alan Wood Steel Co.

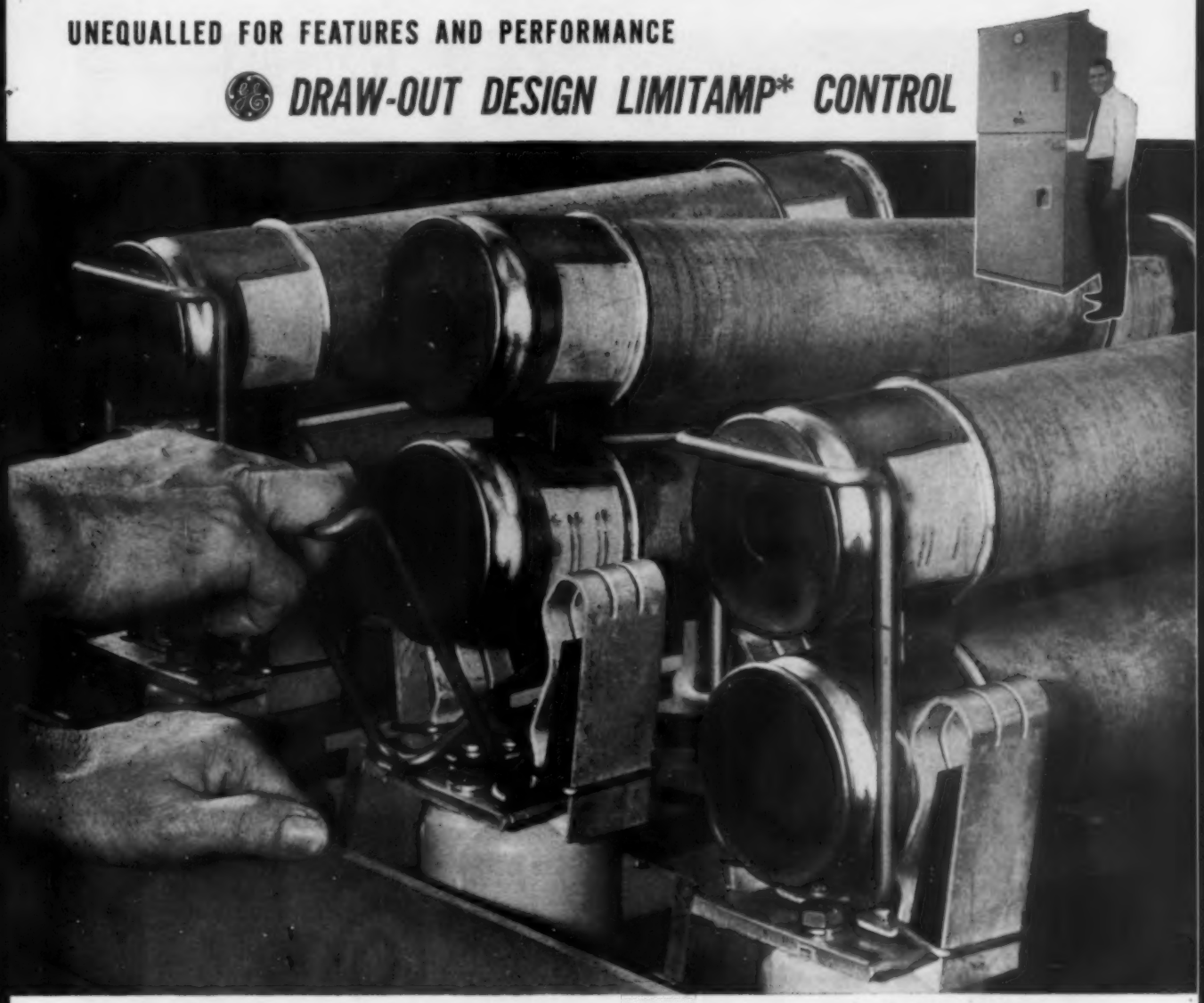
For a copy, circle 358 on Post Card

Screw Fastening of Aluminum

This 48-pp technical handbook covers standard and special fasteners

UNEQUALLED FOR FEATURES AND PERFORMANCE

DRAW-OUT DESIGN LIMITAMP* CONTROL



INTERRUPTS IN 1/2 CYCLE

...protection when you need it—with Limitamp control

Here is performance you can count on ... to start, stop, and protect your motor under *your* environmental conditions!

General Electric's draw-out Limitamp control, rated 2300- to 4600-volts for a-c motors up to 3000 hp, interrupts in the first ½ cycle. Current is limited in the first ¼ cycle. EJ-2 fuses—the standard of excellence—give you this dependable short-circuit protection.

Performance of the draw-out contactor is outstanding under all load conditions—from small motors running light to large motors at "locked rotor." A new blow-out structure and an improved arc chute with superior extinguishing action provides this improved performance. What's more, the new Limitamp contactor meets a 60-kv base impulse level.

Complete design coordination and exhaustive testing in General Electric's high voltage laboratories of bus, cable, current transformers, contactors, fuses, insulators, and overload relays means top protection for men and equipment!

Ask your G-E sales representative about other advanced-design operation, installation, and maintenance features of new Limitamp control. Or, write today to Section 783-26, General Electric Company, Schenectady, New York for descriptive Bulletin GEA-6893.

Industry Control Dept., Salem, Va.

* Reg. Trade-mark of General Electric Co.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Circle 613 on postcard, page 33

TERRIFIC MAINTENANCE TIME-SAVER!

Porter-Cable Porta-Band Saw

Cuts all metals—even grades of stainless and tool steels—fast, smoothly, clean, and in hard-to-get-at places. Cuts plastics, too, and problem materials. Zips through pipe, cable, castings, housings, metal lath, rods, bars . . . you name it, this Band Saw will cut it! And fast!

Well balanced, easy-to-use. Rugged 6.5 amp. universal motor, blade speed 240 sfpm. Ten blades available from 6 to 24 teeth per inch, standard and Hi-Speed Steel.

Take a good look at this Porta-Band Saw and ask your dealer for a free on the job trial. It'll pay its way over and over and over.

FREE CATALOG shows complete line of Porter-Cable tools and accessories. Write: Rockwell Manufacturing Company, Porter-Cable Division, N. Lexington Ave., Pittsburgh 8, Pa.

PORTER-CABLE MACHINE COMPANY
Subsidiary of Rockwell Manufacturing Company
Pittsburgh 8, Pennsylvania

Porter-Cable
another fine product by
ROCKWELL

Circle 614 on postcard, page 33

DATA FILE

(Begins on page 178)

and fastening systems used to join aluminum assemblies. Includes list of manufacturers of screw fasteners. Reynolds Metals Co.

For a copy, circle 359 on Post Card

WIRE ROPE, CHAINS, SLINGS

Wire Rope Guide

Catalog WR-722 presents 28-pp of information on characteristics, constructions, and grades of wire rope. Provides breaking strengths, safe working loads for industrial, other use. The Colorado Fuel & Iron Corp.

For a copy, circle 360 on Post Card

Use and Abuse of Wire Rope

Correct use of wire rope, and abuses that shorten wire rope life, are illustrated with cartoon caricatures in this 28-pp handbook. Information on rope and sling saving is included. Union Wire Rope Corp.

For a copy, circle 361 on Post Card

How To Be a Wire Rope Expert

Basic principles governing selection of proper rope construction are covered in this 16-pp booklet. Gives five factors to be considered. The D/d ratio device for determining best relationship of rope size to sheave or drum size is illustrated. Leschen Wire Rope Div., H. K. Porter Co., Inc.

For a copy, circle 363 on Post Card

On Conveyor Chain Selection

This 38-pp engineering reference book contains information on selection, installation, and maintenance of chain for conveying and elevating. Comparison tables, trouble shooting charts provided. Moline Malleable Iron Co.

For a copy, circle 364 on Post Card

MAINTENANCE

Long Run Paint Economy

Paint selection factors are detailed in the sixth edition of "Engineered Color," 20 pp. Covers proper use of paint and color, requirements of various surfaces, color and the safety program. Describes interior and exterior primers, finishers, varnishes, etc. Barreled Sunlight Paint Co.

For a copy, circle 366 on Post Card

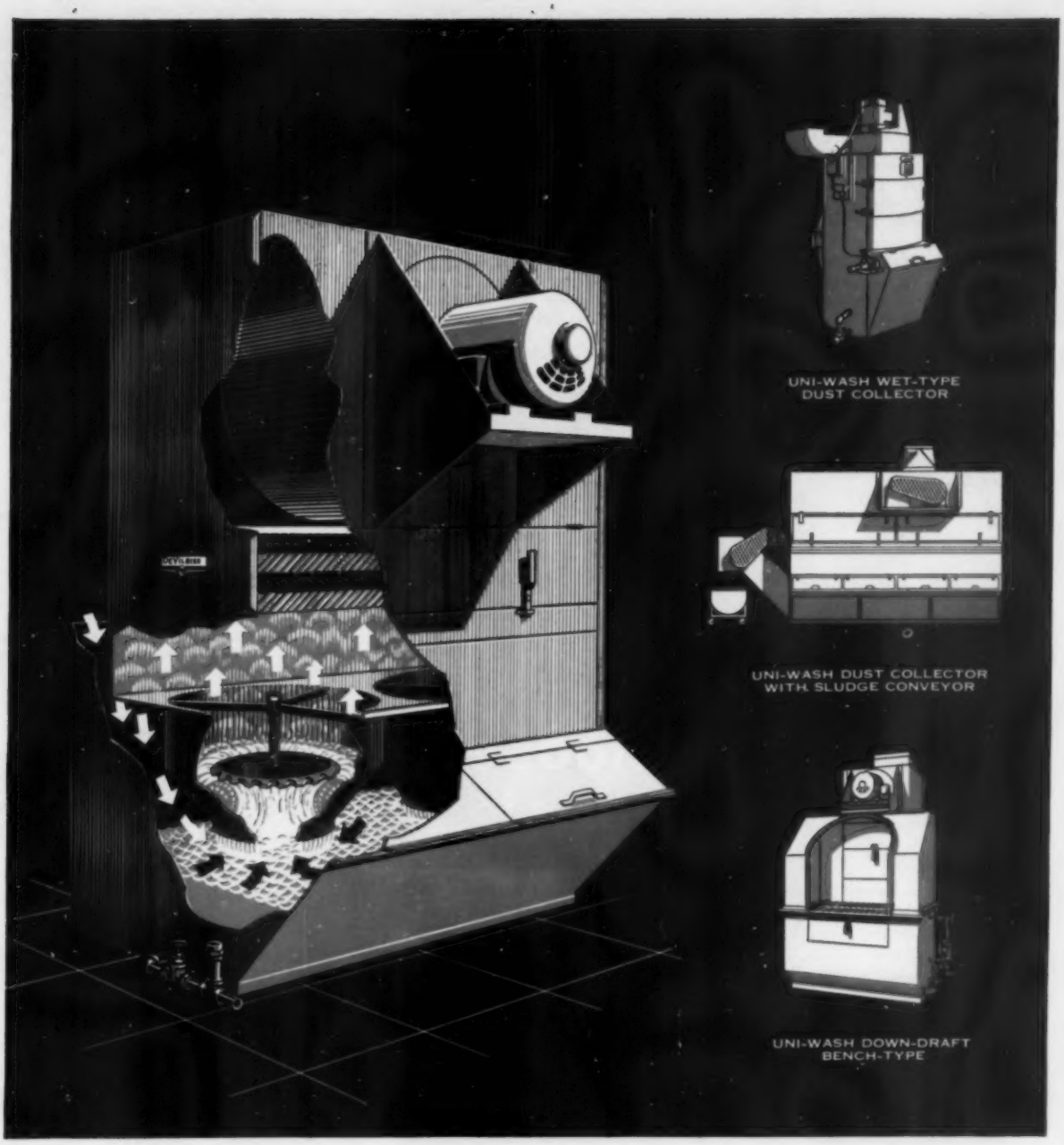
Corrosion-Proofing for Industry

Bulletin 1-2 describes corrosion-proofing materials and services, including linings, coatings, flooring, acid-proof brick, reinforced plastic processing and ventilating equipment, cements, grout and adhesives. Chemical resistance chart included. The Ceilcote Co.

For a copy, circle 368 on Post Card

Epoxy Chemical Resistant Enamel

Bulletin 1001 describes Corlar, an enamel for abnormal exposures to



dust collectors from DeVilbiss are your answer if you have a problem involving process dust. This Uni-Wash wet-type unit washes, scrubs, and fogs contaminants from the air stream during processing. Other types remove vapors, corrosive fumes, chips, dirt, sticky mists. DeVilbiss can build complete systems to your specifications—or furnish standard units ready for bolting to your floor.

Talk to DeVilbiss about all your process dust collection problems

FOR TOTAL SERVICE, CALL
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THE DeVILBISS COMPANY, Toledo 1, Ohio. Also Barrie, Ontario; London, England; São Paulo, Brazil. Branch offices in principal cities.

Circle 615 on postcard, page 33

DATA FILE

(Begins on page 178)

fumes, spillage and moisture. Covers characteristics, applications, coverage and preparation. E. I. du Pont de Nemours & Co., Inc.

For a copy, circle 370 on Post Card

Vacuum Cleaning Equipment

Suction cleaning equipment for wet and dry dust and dirt removal is featured in a series of product bulletins. The National Super Service Co.

For a copy, circle 371 on Post Card

Floor Maintenance Equipment

Information on floor machines and cleaning equipment is presented in file folder of publications. Bulletins on power sweepers, heavy-duty sweepers, floor maintainers, wet-dry vacuum cleaners, tank adapters are included. Clarke Floor Machine Co.

For a copy, circle 372 on Post Card

LUBRICATION

Organized Lubrication Benefits

Major cost control factors of organized lubrication are told in this 24-pp bulletin. Covers cost control opportunities, assigning responsibilities. Texaco, Inc.

For a copy, circle 374 on Post Card

Selection, Use of Lubricants

Characteristics, advantages of specialized fluid and grease type lubricants are given in 32-pp Data Book 59-2. Covers control of friction, use of grease type lubes, proper application, recommendations for various operating conditions. Lubri-plate Div., Fiske Brothers Refining Co.

For a copy, circle 375 on Post Card

Multi-Purpose Greases

Information on six Litholine greases is presented in this product bulletin, giving advantages offered. Sinclair Refining Co.

For a copy, circle 376 on Post Card

Extreme-Pressure Lubricant

Properties and applications of a semi-fluid extreme-pressure lubricant are detailed in Technical Bulletin 64. Specification data. Sun Oil Co.

For a copy, circle 378 on Post Card

TOOLS, MACHINE SHOP

Power Tool Information

Portable and stationary power tools and equipment are featured in 8-pp Catalog 900. Hydraulic cable and wire rope cutters, pneumatic cutters, cut-off and upset machines, custom built hydraulic tools and workheads shown. H. K. Porter, Inc.

For a copy, circle 380 on Post Card

Tool Selection Made Easy

Detailed selection data on holders, set-up and hold-down tools, tool bits, machine shop specialties, wrenches, socket wrenches, sets containing wrenches and detachable sockets, miscellaneous hand tools and pipe tools are in 132-pp Catalog 700. Armstrong Bros. Tool Co.

For a copy, circle 381 on Post Card

Pipe Tool Guide

Application data on Rigid pipe tools is provided in 16-pp Catalog 7596R-6. Wrenches, cutters, threaders, reamers, vises and others are illustrated. The Ridge Tool Co.

For a copy, circle 382 on Post Card

Industrial Power Tools

Data on power tools for construction, production and maintenance are presented in 38-pp Form 85. Covers drills, hole saws, magnetic drill presses, screwdrivers and accessories, impact wrenches, belt sanders, grinders, grinding wheels, saw blades. The Black & Decker Mfg. Co.

For a copy, circle 383 on Post Card

Guide to Power Tools

Presented in this 68-pp catalog are electric and pneumatic tools for production, maintenance, construction, wood and metal working. Features worm drive and high speed saws; reciprocating saws; jig saws; hammers; planes, routers; sanders; drills; drivers; wrenches. Skil Corp.

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Portable Electric Tool Guide

Detailed specifications, application data and photos on electric saws,

This Wayne Power Sweeper and its operator are saving on *more* than plant maintenance alone. Not only do they cut plant clean-up time and eliminate costly push broom methods—but provide these *extra* advantages as well . . .

—You can clean more plant area more often, saving on damage to machinery from dust and dirt.

—You protect rolling stock against tire and caster damage.

—You maintain the sparkling surroundings your employees want and need for best efficiency.

There's hardly a spot where Waynes can't go. They work right up to machinery . . . in congested areas . . . on loading docks . . . in parking lots . . . on sidewalks—wherever debris accumulates. They pick up everything from fine dust to pop bottles—and never raise a dust cloud while doing it! *In most plants, one man and a Wayne can handle the entire sweeping program and still free the operator for other work!*

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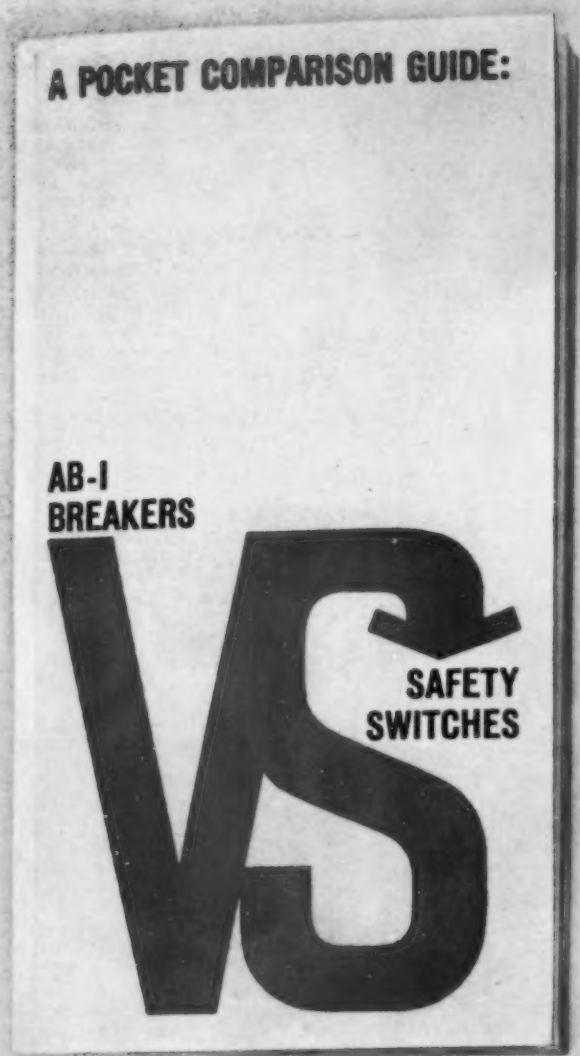
Circle 616 on postcard, page 33



We make both but we recommend AB-I Breakers over Safety Switches. Why?

Why are we so sure the new Westinghouse AB-I Circuit Breaker is better than any safety switch? We should know. Westinghouse makes safety switches, too—the best you can buy. Read the whole story in this 32-page "Pocket Comparison Guide." Ask your Westinghouse distributor or sales representative for your free copy, or just use the reader service card in this magazine. Westinghouse Electric Corporation, Standard Control Division, Beaver, Pa.

You can be sure . . . if it's

Westinghouse

J-30228

Circle 617 on postcard, page 33

DATA FILE

(Begins on page 178)

sanders, drills, planes, routers, shapers, grinders and accessories are included in 36-pp Catalog 109. The Porter-Cable Machine Co.

For a copy, circle 385 on Post Card

Fastening Tool

Illustrated in Catalog Form B-141 is the Duo-Jobmaster for tough fastening jobs into steel or concrete. Features, advantages detailed. Ramset Div., Olin Mathieson Chemical Corp.

For a copy, circle 386 on Post Card

Flame Spraying Processes

Basic engineering and application data on flame-sprayed coatings of metals, ceramics, carbides and other high-melting-point materials are presented in 16-pp Bulletin 136B. Includes charts. Metco, Inc.

For a copy, circle 388 on Post Card

PROCESSING, FINISHING—

Finishing, Processing Equipment

Industrial Equipment Catalog A-661 covers finishing and processing equipment and systems. Metal cleaning, surface preparation, pickling or rust-proofing, spray booths; drying, baking and processing ovens; control components; dust and fume-control equipment. The R. C. Mahon Co.

For a copy, circle 389 on Post Card

For Industrial Processing

Illustrated and described in this 20-pp bulletin are ovens, parts washers and phosphatizing machinery, dust and fume collectors and spray booths. Gallagher-Kaiser Corp.

For a copy, circle 390 on Post Card

Finishing Equipment

Contained in this file folder is a series of product bulletins on manual and automatic finishing equipment, including spray guns, nozzles, pumps, tanks, heaters, air compressors, regulators, hose. The De Vilbiss Co.

For a copy, circle 392 on Post Card

ELECTRICAL—

Multi-Shielded Motor

Dimensional, selection and application data on multi-shielded a-c motors provided in Catalog 200, 56 pp. Information includes modifications. Sterling Electric Motors, Inc.

For a copy, circle 393 on Post Card

Distribution Transformers

Dry type distribution transformers, single and three phase, are featured in 16-pp Bulletin 5A2-BL01. Wiring diagrams provided. Acme Electric Co.

For a copy, circle 394 on Post Card

Distribution Equipment Guide

Detailed information on electrical distribution equipment is presented in 82-pp '60 Marketeer, Catalog M-160. Equipment described include: Electrostrip multi-outlet assemblies, switches, panel-boards, switchgear assemblies and electrical ducts. Bull-Dog Electric Products Co.

For a copy, circle 395 on Post Card

Metal-Clad Switchgear

Twenty-pp Bulletin 2801-2A describes 4160-v metal-clad switchgear with stored-energy closing, closed-door drawout. Features of the roomy but compact gear, including maintenance procedures and safety provisions, are detailed. I-T-E Circuit Breaker Co.

For a copy, circle 396 on Post Card

Small Motor Switches

Small motor switches for small motor driven tools, heater units etc. are described in 14-pp Bulletin EA-114. Includes selection charts and mounting data. Cutler-Hammer, Inc.

For a copy, circle 397 on Post Card

Fused Interrupter Switch

Eight-pp Bulletin PSGL features a fused interrupter switch designed to employ current-limiting and overload characteristics of dual-element fuses in low voltage feeders having capacities to 100,000 rms symmetrical amperes. Pennsylvania Transformer Div., McGraw-Edison Co.

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Power Switching Centers

Form F 1700, 12 pp, introduces coordinated combinations of switches,

SIX COMMON PLANT FACILITIES...

ONE COMMON PROBLEM...

...LICKED BY E.R.P. CATHODIC PROTECTION

The problem common to all buried or submerged metals is corrosion. Electro Rust-Proofing stops corrosion . . . stops it permanently, efficiently, economically.

E.R.P. engineers survey your protection needs and design the best system for you. Then cathodic protection takes over. Your tanks and piping, piers and towers, stay like new. E.R.P. systems eliminate downtime for repairs, cut painting and labor costs. You get sure protection. Your corrosion worries disappear.

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Circle 618 on postcard, page 33

This Patented

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Design makes the difference! Don't settle for less than the exclusive Lyon CLIP and STUD which many have tried to copy but none can duplicate. Fully protected by Government patents, Lyon CLIP and STUD obsoletes conventional steel shelving and guarantees you these *extra dividends*—

- ★ Easy, fast, low cost assembly.
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- ★ Tremendous structural strength and rigidity.

Another extra dividend from Lyon—oldest and leading steel shelving manufacturer—an experienced Lyon Storage Engineer and Lyon Dealer as near as your phone—ready to help you save space, time, money.

There is a type of Lyon Shelving for every application—open, closed, bin, counter, sliding shelf, tool, mezzanine. Above—a typical tool room installation.

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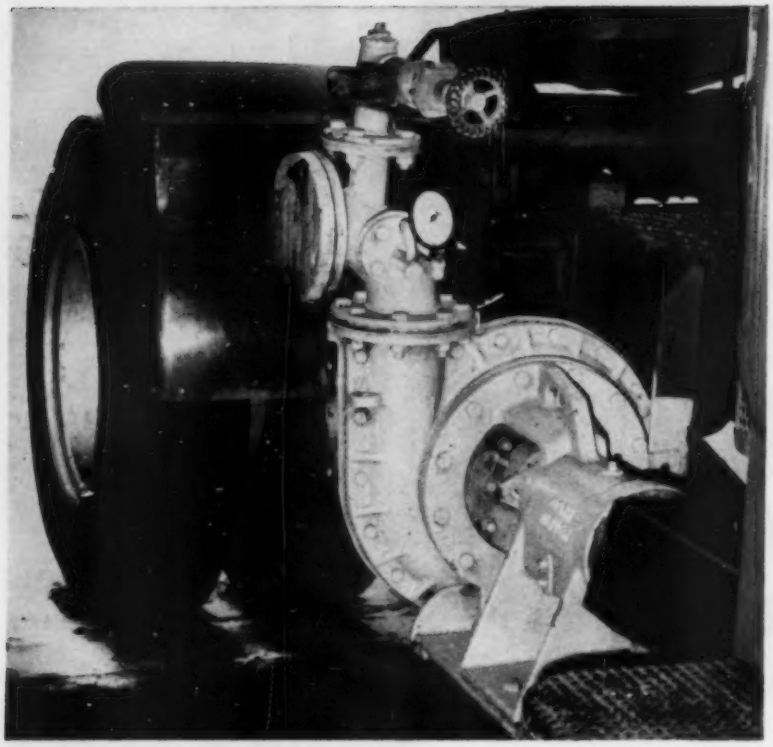
• Stools	• Drawing Tables	• Shelving	• Work Benches	• Drawer Units	• Parts Cases	• Toolroom Equip.	• Slotted Angle
• Lockers	• Filing Cabinets	• Bin Units	• Bench Drawers	• Shop Boxes	• Bar Racks	• Service Counters	• Wood Working Benches

Circle 619 on postcard, page 33



Truck-mounted

Dorr-Oliver® Pumps

selected for chemical cleaning service

A specialized service involving the removal of scale deposits from boilers, heat exchangers and process equipment in the utility, chemical, petroleum and other industrial plants is offered by Sumco Engineering, Inc., Passaic Avenue, Caldwell Township, New Jersey.

Under close supervision of service engineer, truck-mounted tanks and pumps are used to circulate chemical solutions through the equipment being cleaned. Service is often tough on the pumps, since corrosive chemicals and frequent accumulations of abrasive scale are handled.

To meet the varied demands of this service, the trucks are equipped with Dorr-Oliver Hypalon-lined acid-handling pumps, long recognized by the chemical industry for their freedom from leakage and their ability to stand up under corrosive and abrasive conditions.

Dorr-Oliver offers a range of pumps specifically designed for chemical applications. For information on types for your particular service, write to Dorr-Oliver Incorporated, Stamford, Connecticut.

Hypalon—Reg. T.M. E. I. duPont de Nemours & Co.

DORR-OLIVER

WORLD-WIDE RESEARCH • ENGINEERING • EQUIPMENT

Circle 620 on postcard, page 33

DATA FILE

(Begins on page 178)

operating mechanisms, fuses and housings with single assembly ratings to withstand effects of closing and carrying, and when fused, interrupting valves of current up to assigned short circuit ratings. I-T-E Circuit Breaker Co.

For a copy, circle 399 on Post Card

Capacitor Guide

Featured in 26-pp Catalog C-913 are electrolytic capacitors for capacitor-start motors, and capacitors for permanent split-phase capacitor motors, capacitor-start, capacitor-run units for air conditioning. Selection tables and interchangeability guide included. Sprague Electric Co.

For a copy, circle 400 on Post Card

Aluminum Electrical Fittings

Catalog 61, 38 pp, provides data on aluminum conduit bodies, connectors, couplings, dust-tight fixtures, elbows, fixture hangers, floodlighting, switch fittings, instrument boxes, junction boxes, motor starters, panel boards, others. Killark Electric Co.

For a copy, circle 402 on Post Card

Guide to Electrical Supplies

This catalog is divided into sections covering wire connectors, electricians' tools, electrical specialties, motor maintenance supplies, blowers and cleaners, wire strippers, soldering equipment. Ideal Industries, Inc.

For a copy, circle 403 on Post Card

Electrical Equipment Digest

Presented in 168-pp Catalog Digest 143 are load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

For a copy, circle 404 on Post Card

Cable Support Equipment

Described in 28-pp Catalog 5912 are two types of cable trays or tube raceways—the ladder type and the basket small opening type—for cable, wiring and tubing support. Includes dimensions. The Globe Co.

For a copy, circle 405 on Post Card

LIGHTING

Modern Lighting Needs

"Footcandles in Modern Lighting" is a 20-pp booklet giving lighting level recommendations for seeing tasks involved in many activities. Figures based on findings of Illuminating Engineering Research Institute and Illuminating Engineering Society. General Electric Co.

For a copy, circle 411 on Post Card

Floodlight Data

Specifications and photometric data on company's Quartz-beam floodlight given in Bulletin 2725. Applications

include building lighting, outdoor construction, loading docks and others. Crouse-Hinds Co.

For a copy, circle 412 on Post Card

INSTRUMENTS, CONTROLS—

Sight Flow Indicators

Flapper and rotary types of sight flow indicators are described in Bulletin 18W. Covers constructions details, dimensions, operating limits etc. Schutte and Koerting Co.

For a copy, circle 414 on Post Card

Temperature Regulators

Eight-pp Catalog J180-1 contains information on sliding gate and plate temperature regulators for steam, water, air, oil, gas or chemicals. Sizing charts, flow curve, specifications and engineering data given. OPW-Jordan Corp.

For a copy, circle 417 on Post Card

For Liquid Measuring

What the King gage is, how it operates and some of its many applications, are explained in 12-pp Catalog 1010. Dimensions, models and depth capacities. King Engineering Corp.

For a copy, circle 418 on Post Card

Alarm Indicating Monitor

Eight-pp Bulletin MSP-195 features an alarm indicating monitor for equipment, manpower and space protection by steel refineries, chemical, electrical and cold storage plants. Hagan Chemical & Controls, Inc.

For a copy, circle 419 on Post Card

Equipment for Measuring Sound

Bulletin 797-E contains 16 pp of information on sound-measuring equipment, including sound-level meters, vibration meters, analyzers and accessories. Industrial applications shown. General Radio Co.

For a copy, circle 420 on Post Card

Valve Actuating Unit

Catalog V-200 describes the Valvmatic, a unit designed for converting hand-operated valves to automatic operation. Advantages are listed. C. H. Wheeler Mfg. Co.

For a copy, circle 421 on Post Card

MATERIALS HANDLING——

Roller, Wheel Conveyors

Illustrated Catalog 158 contains 68 pp of data on roller and wheel conveyors for a variety of applications. Dimensional diagrams, load rating tables and photos of installations are given. Mathews Conveyor Co.

For a copy, circle 422 on Post Card

Hoists for Many Jobs

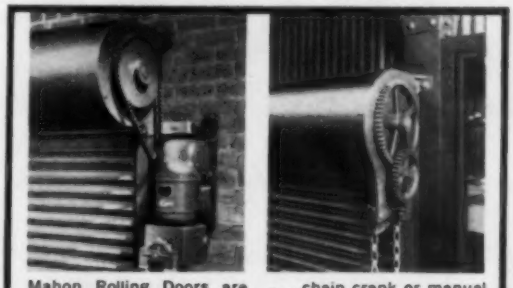
Bulletin 142-H, 26-pp, features the Meteor hoists with single- or two-speed control, and discusses suspension types, trolleys, accessories, clearance diagrams, and prices. Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp.

For a copy, circle 423 on Post Card

King-size (43-ft. wide, 22-ft., 7-in. high) Mahon Rolling Steel for a Detroit warehouse of Grand Trunk & Western Railroad. Contractor: F. H. Martin Construction Company.

MAHON ROLLING DOORS

Open: Mahon Rolling Doors are versatile space savers. **Shut:** they are sturdy protection. In between both stages, they are convenient, quick-acting, work and time savers. Mahon supplies Rolling Doors in standard or Underwriters' Labeled Types to suit your specific needs for new or old openings. All-metal construction with Bonderized slats insure long life, minimum maintenance. Whether you're building, modifying or replacing—investigate the multiple-benefit 'case' for Mahon Rolling Doors.



Mahon Rolling Doors are available in power-operated . . . chain crank or manual types in all models.

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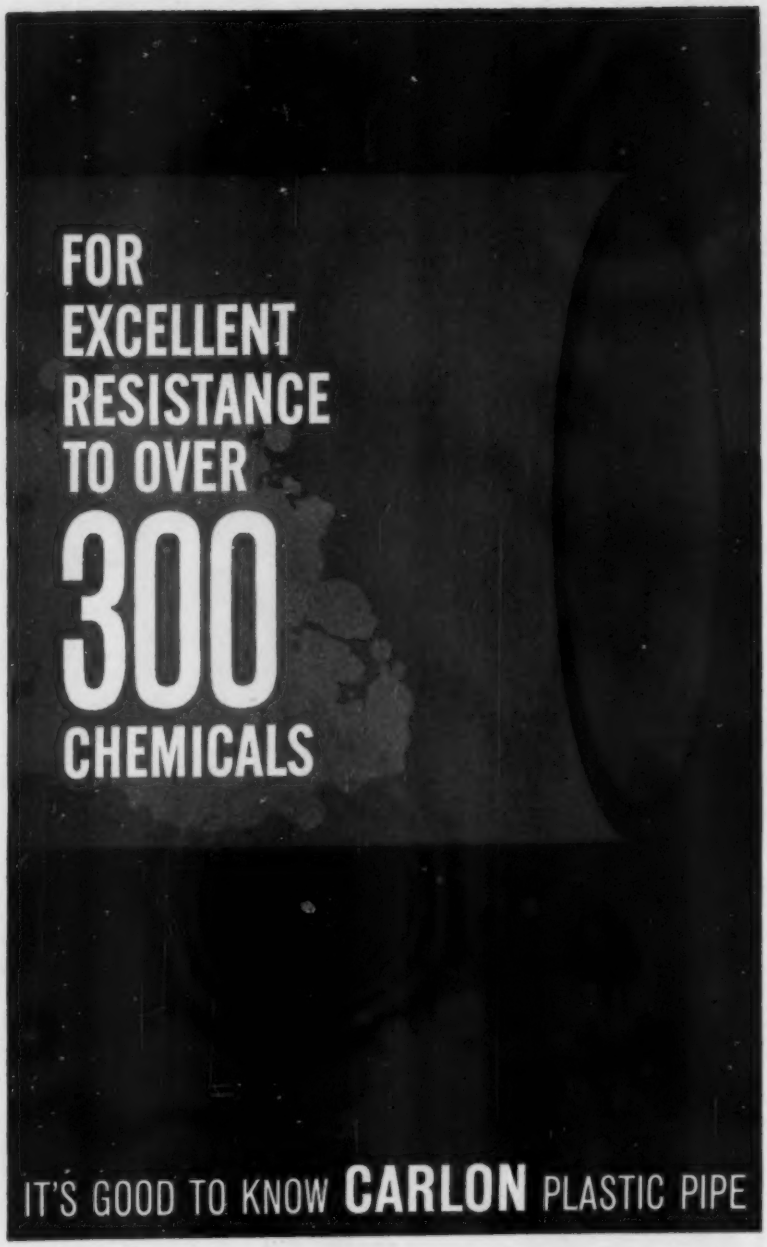
MAHON

WRITE FOR ROLLING DOOR CATALOG G-61—ALSO IN SWEET'S FILES.

Circle 621 on postcard, page 33



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Circle 622 on postcard, page 33

DATA FILE

(Begins on page 178)

Vertical Transportation

Selection of vertical transportation for every traffic-moving job is detailed in 32-pp Bulletin A-382. Various elevators and escalators are described. Otis Elevator Co.

For a copy, circle 424 on Post Card

Sheet, Coil Lifters, All Types

Detailed information on sheet and coil handling lifters and related equipment is presented in 24-pp Bulletin SL-32. Applications are pictured. Cullen-Friestedt Co.

For a copy, circle 426 on Post Card

SAFETY

Fire-Resistant Fluids

This series of specification sheets on fire-resistant fluids covers synthetics, oil-in-water and water-in-oil emulsions, glycols. Mobil Oil Co., Inc.

For a copy, circle 428 on Post Card

Signs for Industrial Safety

Catalog 11, 66-pp, illustrates signs for industrial accident prevention—danger, caution, directional, information and safety instruction signs. Prices given. Stonehouse Signs Inc.

For a copy, circle 429 on Post Card

Alarm Systems for Buildings

Publication 246 contains 36-pp of information on fire alarm systems for applications in industrial and other buildings. Job specifications and accessory equipment included. The Standard Electric Time Co.

For a copy, circle 431 on Post Card

VALVES, TRAPS, PIPING AND FITTINGS

Stainless Steel Valves

Catalog 59SS, 32 pp, on stainless steel valves, illustrates design and construction features. Details advantages in withstanding corrosive atmospheres. Jenkins Bros.

For a copy, circle 433 on Post Card

Composite Valve Guide

Globe and angle, gate, check, outside-stem-and-yoke valves and many other types in bronze, iron, steel and alloys are catalogued in 24-pp Form 232. Fully illustrated, provides selection information, including application suggestions, features, dimensions and ratings. The Wm. Powell Co.

For a copy, circle 434 on Post Card

Pinch Valves

Construction features of Massco-Grigsby pinch valves are explained and illustrated in 14-pp Catalog 609. Provides sleeve service recommendations and specifications for manual, motorized, hydraulic types. Mine and Smelter Supply Co.

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"Made OF Stainless Steel ...Made BY Jenkins"

Valve Performance Shows the Big Difference in that Spec!

When service conditions require valves of Stainless Steel, remember that metal is only part of the answer to long, dependable valve performance.

The WAY valves are made is equally important. Factors you can't even see make a big difference. Such factors as *perfection of castings . . . precision machining . . . painstaking inspection and testing . . . sound design.* Most important of all: *the maker's guiding policy about quality.*

To be sure about all these critical factors, experienced specifiers and buyers specify JENKINS as well as the metal alloy when Stainless Steel valves are needed. It is well-known that for almost a century Jenkins has made valves to *just one* standard of quality . . . the highest. At Jenkins every operation, every worker is aimed at fulfilling that standard, whatever metal a valve is made of.

SEND FOR NEW CATALOG 59-SS of Jenkins Stainless Steel valves in types and alloys to satisfy most needs. Jenkins Bros., 100 Park Ave., New York 17.

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MOST TRUSTED TRADEMARK IN THE VALVE WORLD
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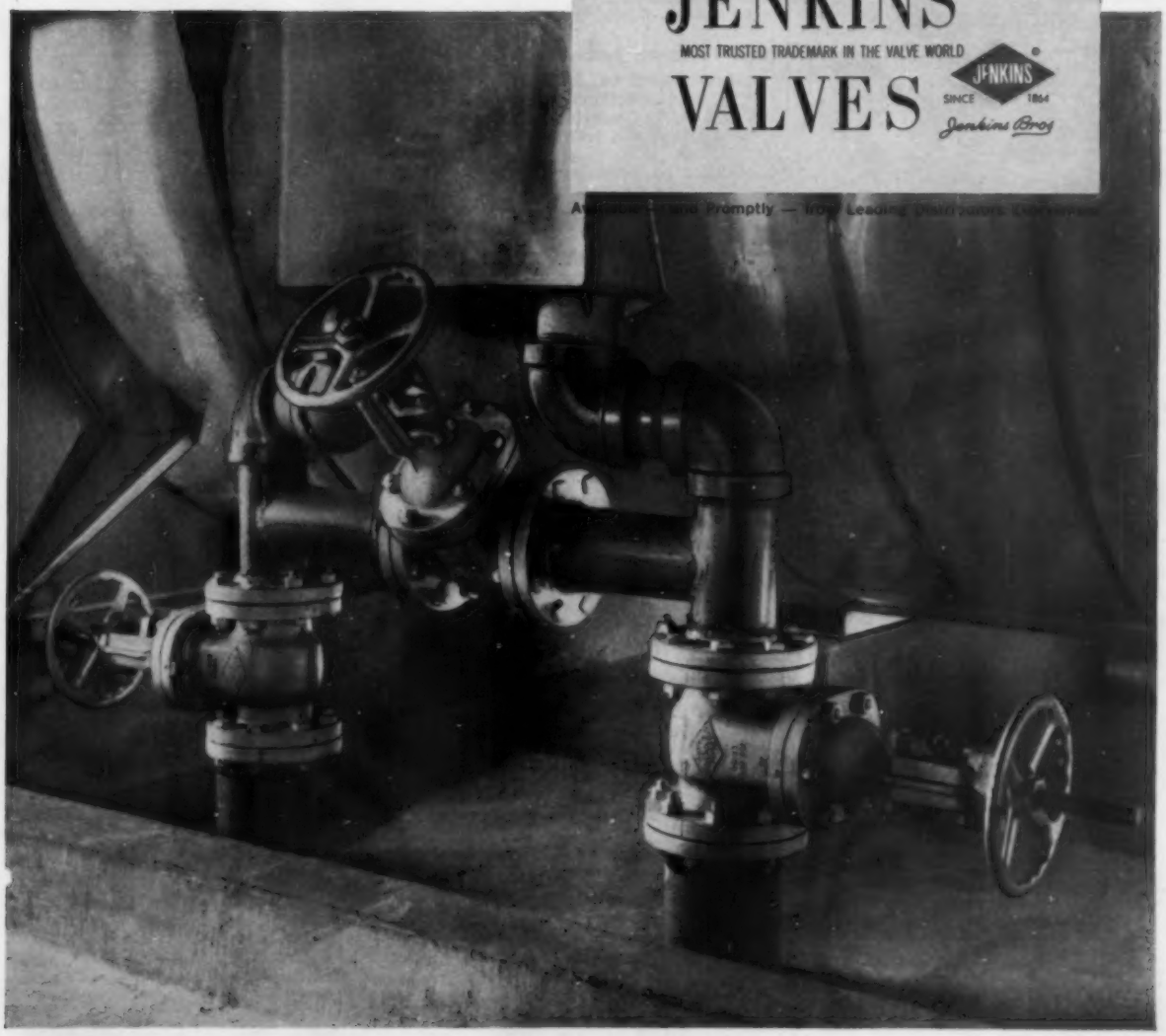
JENKINS SINCE 1864
Jenkins Bros



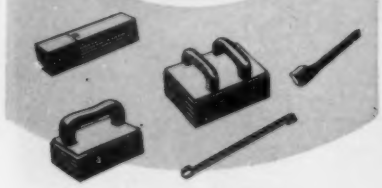
Circle 623 on postcard, page 33

SAVE down-time man-hours and money

keep D.C. motors running longer at lower cost . . .

IDEAL

RESURFACERS refinish commutators and slip rings without dismantling



- Performance matched for every condition
- A size and type for all needs
- Accepted standard for quality and uniformity for over 40 years

NO. 80 IDEAL RESURFACERS for commutators and copper alloy slip rings are made in six grades. Extra coarse—very fast cutting — for "hogging" off excessive copper. Coarse — for fast cutting. Medium for high mica, small ridges and burns. Finish—for finishing after above uses, and removing small burns and ridges. Polish—fine grade for burnishing. Extra Polish—for production finishing of small commutators.

NO. 81 IDEAL RESURFACERS for cast iron and steel slip rings only, in coarse, medium and finish grades as detailed above.

Get the facts on Ideal's complete line of Resurfacers, Flexible Abrasives, Mica Undercutters, Precision Grinders and other accessories. Send coupon for complete Motor Maintenance Catalog.

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3879-H Park Avenue, Sycamore, Ill.
Send me Motor Maintenance Catalog.

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Company_____

Address_____

City_____ Zone____ State_____

SOLD THRU AMERICA'S LEADING DISTRIBUTORS

Circle 624 on postcard, page 33

DATA FILE

(Begins on page 178)

Air Control Products

Described in 16-pp bulletin Form A-320 are air cylinders and air control valves, including solenoid and manual valves for a variety of applications. A. Schrader's Son.

For a copy, circle 437 on Post Card

Monel, Nickel Valves

Corrosion resistant valves of Monel and nickel are discussed in Bulletin 9. Mechanical properties, compositions given. Alloy Steel Products Co.

For a copy, circle 438 on Post Card

PVC Pipe, Fittings, Valves

Physical properties, features, fabrication, installation, operating pressures and temperatures, dimensions and weights of polyvinyl chloride pipe, fittings, flanges and valves are discussed in this 16-pp bulletin. Includes corrosion resistant chart covering 150 materials. Grinnell Co.

For a copy, circle 439 on Post Card

How To Make Ends Meet

Catalog-Manual 60, 34 pp, presents a simple and efficient method of installing pipe. Couplings, fittings and tools utilized are detailed. Book also shows how this coupling method is adaptable to various types of pipe. Victaulic Co. of America.

For a copy, circle 440 on Post Card

Reader Service Cards for ordering catalogs are on pages 33 and 34.

Steam Traps, Regulators

This 12-pp condensed catalog contains technical and capacity data on steam traps, temperature regulators and heating specialties. Cutaway views included. Sarco Co., Inc.

For a copy, circle 441 on Post Card

Engineering Manual on Traps

This 40-pp manual is designed to assist in the sizing, specifying and selection of steam traps and other fluid specialties. Includes steam trap selection guide with explanation of four basic types of traps and how they perform. The V. D. Anderson Co.

For a copy, circle 442 on Post Card

Steam Trap Fundamentals

Facts on drainage and steam trap operation are presented in this 16-pp primer. Data on trap maintenance included. Barnes & Jones, Inc.

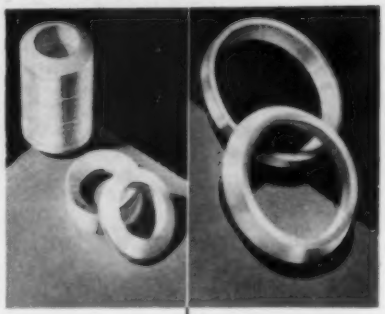
For a copy, circle 443 on Post Card

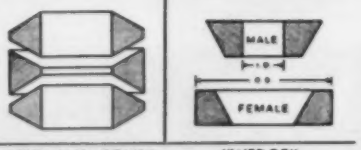
Plumbing, Heating Specialties

Protection and control specialties are illustrated in 12 pp Condensed Catalog C-60. Describes automatic temperature and pressure relief valves, temperature relief valves, gas shutoff valves, others. Watts Regulator Co.

For a copy, circle 445 on Post Card

NEW CHEMPRO LOW GLAND PRESSURE TFE TEFLON† PACKING SETS





"CUP AND CONE" "WEDGE"

USED FOR VALVES, HEAT EXCHANGERS AND OTHER STATIC AND SEMI-STATIC APPLICATIONS

Chempro Style 300 "Cup & Cone" and Style 305 "Wedge" packing ring sets are two new resilient, low gland pressure packings designed for tight, sure sealing with a minimum gland pressure. Nominal gland pressure causes the rings to slide against each other, exerting pressure both against the stem or rod and the bore.

These packings have all the advantages of Teflon, being completely unaffected by the strongest acids, solvents and alkalies.

COMBINATION SETS AVAILABLE FOR ROTATING SERVICE

Resilient Chempro "Cup & Cone" or "Wedge" rings can be combined with tough, pressure-resisting Chempro Style 101 packing rings to form a rugged combination set ideal for use on a wide range of rotating or reciprocating services.

Write for revised Chempro Bulletin CP-552, giving complete ordering information.

† duPont trademark

CHEMICAL & POWER PRODUCTS, Inc.

7 Broadway, New York 4, N. Y.

Circle 625 on postcard, page 33

Acme ACME Electric

FURNACE TRANSFORMERS

DO THE JOB!

Designing Furnace Transformers is a job for experts — and Acme Electric engineers have the experience, the "know how" and the facilities to design and build the kind of transformers that will successfully handle the difficult requirements of electric furnace requirements.

The transformer illustrated is one of several, connected to a vacuum furnace and operating at preselected temperatures over a range of 1900° to 2500°C. which must be maintained within close limitations.

If you need Furnace Transformers as part of the equipment for special, secret or unusual temperature processing, Acme Electric is your best source of supply.

ACME ELECTRIC CORPORATION

367 Water St. Cuba, N. Y.

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BAA3007/1043

Acme ACME Electric
TRANSFORMERS

Circle 626 on postcard, page 33

Four to choose from
in high-voltage power cable

You can match precisely the conditions your high-voltage power cable is exposed to when you specify Rome.

The reason is simple: Rome offers both oil-base and butyl-base insulation as well as a choice in jacketing.

Four of the more popular combinations are: (1) Rozone inside . . . Roseal outside, (2) Rozone A inside . . . Roseal outside, (3) Rozone inside . . . Roprene outside, (4) Rozone A inside . . . Roprene outside.

With *Rozone* you have a premium oil-base insulation with high resistance to corona, ozone and water, as well as high dielectric and impulse strength. *Rozone A* (butyl-base) has excellent ozone resistance and also protects against extremes in temperature.

In jacketing, *Roseal*, a thermoplastic compound, provides excellent mechanical and weather protection. It also resists abrasion, heat, flame, moisture, oils and most chemicals. It is recommended as a nonmetallic sheath over shielded and unshielded power cable and can be used underground or overhead.

Roprene, a thermosetting compound, provides added heat resistance plus adequate resistance to most environments. Unlike fibrous coverings, it does not need to be cut back at terminals and splices. So it completely protects exposed ends on unshielded cables. Like Roseal, this compound can be used overhead or underground.

Need high-voltage cable now? Rome offers "off-the-shelf" delivery for many types. Get all the facts from your area sales office. Or write to Rome Cable Division of Alcoa, Dept. 5-81, Rome, N. Y.

ALCOA
ROME CABLE
DIVISION

Circle 627 on postcard, page 33

All These Services from your LUNKENHEIMER DISTRIBUTOR

- FASTER DELIVERY
- EMERGENCY SERVICE
- TRAINED PERSONNEL
- SIMPLIFIED PURCHASING
- NEARBY WAREHOUSING
- DEPENDABLE VALVE APPLICATION SERVICE

Let us show you the brand new BALL VALVES and BUTTERFLY VALVES

FOR THE BEST • QUALITY
FOR THE BEST • SERVICE

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INDUSTRIAL DISTRIBUTORS — SERVING INDUSTRY ECONOMICALLY — THE RIGHT HAND OF PRODUCTION

L-1061-15

Circle 628 on postcard, page 33

AVAILABLE from Advertisers

Guide to literature offered this month in ads received by PLANT ENGINEERING before the first of last month

MATERIALS HANDLING

For Overhead Handling—Book 2008 describes efficient, versatile cranes. Cleveland Tramrail Div.
Circle 201 on Post Card

Coil Handling Economy—Motorized coil lifters are discussed in Bulletin SL-32. Cullen-Friestedt Co.
Circle 202 on Post Card

Belt Conveyors—Bulletins UAL. 61, M.I.A. 561. Mathews Conveyer Co.
Circle 203 on Post Card

ELECTRICAL

Secondary Unit Substations—Engineering data in Handbook PSG-559. Pennsylvania Transformer Div.
Circle 204 on Post Card

To Match Conditions—Selection facts on four types of high-voltage power cables. Rome Cable Div.
Circle 205 on Post Card

Motor Protection—Bulletin GEA-6893 tells features of Limitamp control. General Electric Co.
Circle 206 on Post Card

Safer Bus Duct—Facts on XL ducts with built-in safety features. I-T-E Circuit Breaker Co.
Circle 207 on Post Card

Voltage Regulator—Bulletin GEC-1450 details basic types of regulators. General Electric Co.
Circle 208 on Post Card

Autotransformer—Information on Variac continuously adjustable autotransformer. General Radio Co.
Circle 209 on Post Card

Economical Oil Cutout — Bulletin GEA-7191 describes extra small, light cutout. General Electric Co.
Circle 210 on Post Card

Aluminum Entrance Equipment—Catalog on long-service elbows, heads. Killark Electric Mfg. Co.
Circle 211 on Post Card

Long-Lasting Batteries—Facts on truck battery power package. Exide Industrial Marketing Div.
Circle 212 on Post Card

PLANT SECURITY

Burglary, Fire Protection—Reasons why best security is most economical. American District Telegraph Co.
Circle 213 on Post Card

Plant Privacy—Industrial fencing for security, traffic control detailed in catalog. Anchor Fence.
Circle 214 on Post Card

Chain Link Fencing—Information on top grade steel fencing. The Colorado Fuel & Iron Corp.
Circle 215 on Post Card

MECHANICAL POWER TRANSMISSION

For Power Transmission—Bulletins cover Torque-Arm speed reducers; Flexidyne drives, couplings; chain couplings. Dodge Mfg. Corp.
Circle 216 on Post Card

Power Drive Selection—Handy calculator for roller chains and sprockets. Atlas Chain & Mfg. Co.
Circle 217 on Post Card

Coupling Solutions—Facts on wide range of industrial couplings to meet most needs. Koppers Co., Inc.
Circle 219 on Post Card

Bearing Repairs Charted—Handy wall chart lowers cost of bearing maintenance. SKF Industries, Inc.
Circle 220 on Post Card

PACKINGS, SEALS,

Lattice Braid—Economical Teflon pump packing is described in Bulletin AD-185. Garlock, Inc.
Circle 221 on Post Card

More Protection per Dollar—Chempro Teflon packings described in Bulletin CP552 with prices. Chemical & Power Products, Inc.
Circle 222 on Post Card

Seals in Variety—Catalog PK-35A tells of standard and specially-designed seals. Johns-Manville.
Circle 223 on Post Card

Of Nylon Composition—Pumcups for controls, cylinders, pumps are described in Bulletin 5903. Darling Valve & Mfg. Co.
Circle 224 on Post Card

PUMPS, COMPRESSORS

Versatile Vertical Pumps—Bulletin gives details and typical application information. Johnston Pump Co.
Circle 225 on Post Card

Long-Lasting Pumps—Information on pumps that work longer with less maintenance. Buffalo Forge Co.
Circle 226 on Post Card

Vacuum Pumps, Air Compressors—Catalog gives helpful selection information. Gast Mfg. Corp.
Circle 227 on Post Card

Postage-free cards for ordering literature are on pages 33-34.

Dependable Compressor — Bulletin 185 describes balanced/opposed compressor line. Clark Bros. Co.

Circle 228 on Post Card

Two-Stage Compressor—Details on compact, 100-hp stationary unit. Le Roi Div., Westinghouse Air Brake Co.

Circle 229 on Post Card

DUST CONTROL

What To Do about Dust—Facts on dust and its control. Torit Mfg. Co.

Circle 230 on Post Card

Heavy Duty Collectors—Folder on Dustkop collectors. Aget Mfg. Co.

Circle 231 on Post Card

VALVES, PIPING, FITTINGS

For Heavy-Duty Use—Information on solenoid valve with powerful leverage design. The Johnson Corp.

Circle 233 on Post Card

Chemical-Resistant Pipe — Plastic Pipe Fact-pak gives practical product information. Carlon Products Corp.

Circle 234 on Post Card

Versatile Swivel Joints—Catalog G-5 describes full line. Chiksan Co.

Circle 235 on Post Card

MAINTENANCE

Selecting Paint?—Slide Guide gives answers on finishes, primers, thinners. Barreled Sunlight Paint Co.

Circle 236 on Post Card

Drains Plugged?—Details on power cleaners. Kollmann Mfg. Co., Inc.

Circle 238 on Post Card

Vacuum Systems — Systems, and cleaners are described in Catalog 155B, pneumatic conveyors in Bulletin 143-B. The Spencer Turbine Co.

Circle 239 on Post Card

For Cleaner Floor—Details on power sweepers that do the job easier, quicker. Clarke Floor Machine Co.

Circle 240 on Post Card

Suction Cleaners — Catalogs cover units for general floor and plant cleaning, toolside scrap collecting. The National Super Service Co.

Circle 241 on Post Card

CONSTRUCTION

Build Big, Save Big—Facts on quality prefab building. Butler Mfg. Co.

Circle 243 on Post Card

Ready for Erection—Details on expanded metal partitions with Quik erect clips. Globe Co.

Circle 244 on Post Card

Safety Underfoot—A. W. Super Diamond safety floor plate is described in Bulletin SD-S3. Alan Wood Steel Co.

Circle 245 on Post Card

Rugged Floor Package—Details on flooring installations with built-in protection. The Ceilcote Co., Inc.

Circle 246 on Post Card

let
VICTAULIC
cut your piping costs
Let the Victaulic Method save you money on piping costs. Whatever piping material you choose, Victaulic can join it and provide fittings. You save in material cost, in installation time, and in reduced piping maintenance cost.
CUT COSTS WITH OVER 1100 VICTAULIC ITEMS FOR BETTER AND EASIER PIPING
Standard Couplings
Lightweight Couplings
Rigid Couplings
Roust-A-Bout Couplings
Snap-Joint Couplings
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Malleable Iron Fittings
Stainless Steel Fittings
Aluminum Fittings
Nipples and Adapters
Lined Fittings
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Vic-Easy Tools
Plug Valves
for complete information on any Victaulic product, write:
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COMPANY OF AMERICA
P. O. Box 509, Elizabeth, N. J.

Circle 629 on postcard, page 33

LOOKING for the RIGHT CUTTER for those *IMPOSSIBLE* METAL CUTTING *Jobs!*

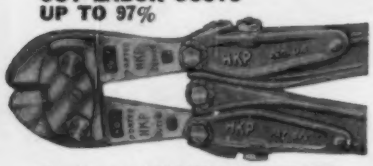
Here's the Curtain-Raiser to a Quick Solution!

HKP PORTER CUTTERS

There's a HAND or HYDRAULIC powered PORTER CUTTER to answer your toughest metal-cutting problems — over 100 different cutters, all designed to save you time, labor, and money! Make short work of cutting:

• Bolts • Rods • Screws • Rivets • Wire • Chain • Steel Strapping • Soft, Medium & Hard Metals & Many Others

CUT LABOR COSTS UP TO 97%



The famous PORTER CENTER-CUT CUTTER . . . our most popular tool . . . is the leading all-around cutter for industrial use! For Free Cutting of Soft and Medium Hard Metals up to ¾". Available in 6 sizes.

. . . and for "PRODUCTION" CUTTING

The PORTER WORK-STATION CUTTER can increase one man's output up to 300% in continuous volume cutting! In 3 sizes — up to ½" capacity!

ALSO . . . for those RUGGED JOBS!

The PORTER HEAVY DUTY CUTTER cuts almost anything in metal up to ¾" diameter — thanks to its heat-treated, hard-tempered center-cut jaws! Comes in 3 sizes.

Contact your Industrial Distributor . . . or write for your free catalog with illustrated, detailed descriptions of the versatile PORTER line!

CUT up to ¾" rods with HAND OPERATED TOOLS — up to 1¾" rods and 1½" power cable with POWER OPERATED TOOLS.

H. K. PORTER, inc.

Somerville 43, Mass.

Circle 630 on postcard, page 33

TOOLS, MACHINE SHOP

Industrial Tools—Catalog 700 shows complete line of machine, hand tools. Armstrong Bros. Tool Co.
Circle 247 on Post Card

Rugged Hammering Power—Facts on Roto-Hammers that drill through reinforced concrete. Skil Corp.
Circle 248 on Post Card

Power Screw Drivers—Data on 17 types. The Black & Decker Mfg. Co.
Circle 249 on Post Card

Efficient Machine Lubrication—Grease, fluid-type lubricants detailed in "Lubriplate Data Book." Fiske Brothers Refining Co.
Circle 250 on Post Card

Lubricants—Information on cutting oil, lubricants, and multi-use grease. Esso Div., Humble Oil & Refining Co.
Circle 251 on Post Card

HEATING, VENTILATING

Thrifty Heat—Data on heating better for less with gas infra-red. Perfection Div., Hupp Corp.
Circle 252 on Post Card

Heating Problems?—Four handbooks help solve them. Reznor Mfg. Co.
Circle 253 on Post Card

Air Intake, Exhaust—Facts on dual-functioning fan with simultaneous action. Clarage Fan Co.
Circle 254 on Post Card

OTHER EQUIPMENT

Flexible Tubing—Catalog detailing tubing resistant to crushing, abrasion, heat, chemicals. Pennsylvania Flexible Metallic Tubing Co., Inc.
Circle 255 on Post Card

Package Chillers—Catalogs 8022A, 8023A give specifications on space-saving cooling unit. Heat-X, Inc.
Circle 257 on Post Card

Sling Safety—Tuffy handbooks tell how to choose wire rope slings, use them safety. Union Wire Rope.
Circle 258 on Post Card

Electronics Courses—Brochure on electronics maintenance training in your plant. Philco Techrep Div.
Circle 261 on Post Card

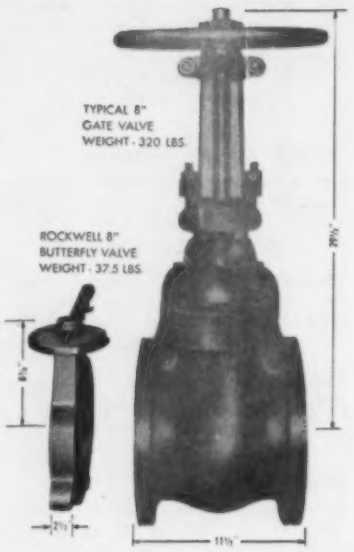
Assemble-Fast Shelving—Catalog describes steel shelving with clip and stud. Lyon Metal Products, Inc.
Circle 262 on Post Card

Relaying Track—Track Kit PE8 covers components needed for railway siding. L. B. Foster Co.
Circle 263 on Post Card

Processing Equipment—General catalog covers washers, ovens, spray booths. Gallagher-Kaiser Corp.
Circle 264 on Post Card

Cleaner Compressed Air—Catalog gives facts on no-maintenance filter. King Engineering Corp.
Circle 266 on Post Card

Compare them
✓ for Weight
✓ for Space



This Rockwell resilient-seated wafer butterfly valve and the large gate valve are both 8" pipe size. Both do the same job. But what a difference in weight, space—and cost.

What does this mean? It means a 60 to 80 per cent reduction in weight in favor of the butterfly valve, depending on size.

As for space, the 8" butterfly valve requires but 8⅜" from center line of pipe for clearance, whereas the gate valve requires over 37" from center line for clearance, when the valve is open.

There are other advantages, too: A quarter turn opens and closes the butterfly valve. The gate valve, however, requires many turns. And operation is easier; maintenance is lower.

Fact-packed Bulletin 590X tells more. Write for it.

W. S. ROCKWELL COMPANY

2920 Eliot St. • Fairfield, Conn.

Made and sold in Europe by
COCKBURNS, Ltd., Glasgow S.W.2, Scotland

Circle 631 on postcard, page 33

BULLETINS

(Begins on page 31)

Ball Bearing Idler

Design and dimensional details on medium-duty ball-bearing belt conveyor rolls, both troughing and return idlers, are presented in Bulletin 456-10. Webster Mfg., Inc.

For a copy, circle 149 on Post Card

Guide to Casters and Wheels

Descriptions, illustrations and technical information on hundreds of casters and wheels in styles, sizes and capacities to meet wide range of requirements are presented in 48-pp Catalog 150. Selection factors, mounting arrangements, cross-sections and specifications included. The Hamilton Caster & Mfg. Co.

For a copy, circle 150 on Post Card

ELECTRICAL

Circuit Breakers, Safety Switches

Comparison guide to costs, sizes, installations and other features of circuit breakers and safety switches is offered in this 32-pp pocket-sized booklet. Highlights advantages of the circuit breakers. Westinghouse Electric Corp.

For a copy, circle 151 on Post Card

High Temperature Switches

Several switch types providing precision snap-action switching in high and low temperatures are described in Form 84-449. Some have a range of —321 to 1000 F; others are hermetically sealed against changes in atmospheric conditions. Mirco Switch, Div., Minneapolis-Honeywell Regulator Co.

For a copy, circle 152 on Post Card

Transite Electrical Conduit

Two types of transite electrical conduit—a thin-walled, asbestos-cement conduit for installation in concrete and a thicker-walled type for direct burial—are described in 12-pp Bulletin TR-247A. Johns-Manville.

For a copy, circle 153 on Post Card

Postage-free cards for ordering Bulletins are on pages 33-34. You may also use the cards to order literature mentioned in the ads.

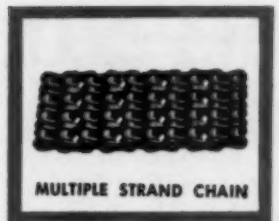
Wiring in Hollow Core Concrete

Sixteen-pp Manual L24 explains use of hollow-core precast concrete floor, roof slabs as raceways for electrical wiring. How to get wiring in and out of the hollow cells, how to feed fixtures from the cell are covered. The Flexicore Co., Inc.

For a copy, circle 154 on Post Card

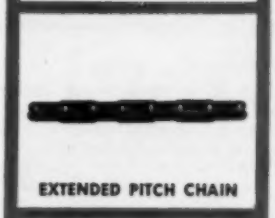
Portable Electrical Testers

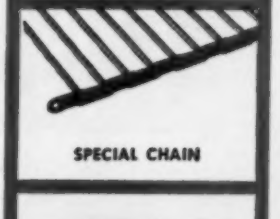
Matched a-c, d-c industrial meters, transformer for use as a-c multiplier, highly sensitive d-c portables and multi-purpose industrial instruments



WHATEVER YOUR TRANSMISSION NEEDS

ATLAS HAS THE RIGHT ANSWER





A. S. A. ROLLER CHAIN
MULTIPLE STRAND CHAIN
EXTENDED PITCH CHAIN
CABLE OR SLING CHAINS
ATTACHMENT CHAIN
OFFSET SIDEBAR CHAIN
FLAT-VEYOR CHAIN
SPROCKETS
FLEXIBLE COUPLINGS

Atlas has the right chain for your power transmission or conveying needs. All are unsurpassed in quality . . . pre-tested to give better service. Atlas Chains are made in all sizes . . . in steel, stainless steel, bronze and Electrolized finish.

For complete details and technical assistance on your chain design or maintenance problems there's an Atlas Engineer to help you. Get in touch with your local Atlas Distributor or write direct for details and catalog to Atlas Chain & Manufacturing Company, West Pittston, Pa.

NEW POWER DRIVE CALCULATOR

Technical data for selection of roller chain and sprockets in slide rule form. Available to engineers upon request.

ATLAS

PRUDENTIAL INDUSTRIES

ATLAS

Circle 632 on postcard, page 33

BULLETINS

(Begins on page 31)

are described in Circular Z-54, 8 pp. Complete data on models, accuracies, ranges, prices included. Weston Instruments Div., Daystrom, Inc.

For a copy, circle 155 on Post Card

For Electrical Insulation

Eight-pp Bulletin CDS-288 features silicone varnishes for impregnating and protective coatings, clear and opaque potting and encapsulating materials, pressure sensitive adhesives, dielectric greases, wire and cable insulation. General Electric Co.

For a copy, circle 156 on Post Card

LIGHTING

Quick Selector for Downlights

Catalog FR2, 12pp, gives features and application data for square, round, eye-ball and low-brightness-aperture incandescent downlights in 75- to 300-w size. The Frink Corp.

For a copy, circle 157 on Post Card

Effective, Economical Illumination

Bulletin 2727, 12pp, illustrates "Par-Beam" sealed-beam floodlights in models to accomodate lamps of 75 to 500 w. Lists footcandle charts, dimensions, lighting selector information, accessories. Crouse-Hinds Co.

For a copy, circle 158 on Post Card

Wide-Angle Luminaires

Catalog 444, 36pp, describes indoor and outdoor reflectors for use with color-corrected mercury lamps. Also presents multiple lights and accessories, mobile work lights. Includes price data. Wide-Lite Corp.

For a copy, circle 159 on Post Card

Combination Air-Handling Troffers

Sylva-Flo troffers with multi-vent for lighting and air conditioning are described in 20-pp brochure. Contains illustrations, technical information and specification details. Sylvania Electric Products Inc.

For a copy, circle 160 on Post Card

Air Diffuser for Troffer

Eight-pp Catalog CLD-70 describes a diffuser permitting coordination of air distribution and illumination in a single ceiling unit. Contains selection and preformance data. Sketches illustrate ceiling applications. Anemostat Corp. of America.

For a copy, circle 161 on Post Card

CONSTRUCTION

Corrugated Roofing, Siding

Form 6482 gives details on corrugated roofing and siding sheets, corrugation pitch information and specification data. Staggered- and straight-joint applications and other construction details shown. Also lists uses, sizes and data on Industrial A-C Board. The Philip Carey Mfg. Co.

For a copy, circle 162 on Post Card

Watertight Masonry Specification

This 6-pp bulletin covers causes of separation cracks, selection of mortar ingredients, types of mortar, shrinkage and bleeding control, effect of mechanical disturbance. The Master Builders Co.

For a copy, circle 163 on Post Card

Steel for Structures, Equipment

"New Concepts in Steel Design and Engineering," 59 pp, describes and compares types that make up the modern family of constructional steels. Illustrations of actual designs and concepts show how these steels can be used to achieve greater strength, lighter weight, lower cost. U. S. Steel Corp.

For a copy, circle 164 on Post Card

Brick Floor Installation Tips

Illustrated information on brick floor installation featuring preparation of corrosion- and wear-resistant joints is provided in Bulletin E-27b. Also covers other money-saving procedures and techniques for installing new floors, repairing existing ones. The Master Builders Co.

For a copy, circle 165 on Post Card

Replacement Window Glazing

Advantages of Plexiglas acrylic plastic as a glazing material are outlined in 8-pp Bulletin PL-465. Details properties of Plexiglas as well as recommended installation techniques. Rohm & Haas Co.

For a copy, circle 166 on Post Card

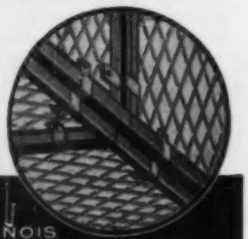
GLOBE SAFE·GARD EXPANDED METAL PARTITIONS with exclusive QUIK-ERECT patented fittings

(FORMERLY HILMAR)

...will answer all your enclosure problems

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut overall costs, cover a wider range of use and require 85% less storage space.

EXCLUSIVE QUIK-ERECT SECTION CLIPS save much of the erection time formerly required. Proven successful in hundreds of installations, these Safe·Gard panels are of welded construction, give longer life, are more rigid and stronger than wire, will not ravel or fray.



Note enlarged detail showing SAFE·GARD Quik-Erect Clips securely joining the interchangeable panels.

Write today for more details or call your Globe (Grip-Strut) Distributor. Distributors in all principal cities, listed under "Grating" in your phone book.

114

PRODUCTS DIVISION | THE GLOBE COMPANY
4016 SOUTH PRINCETON, CHICAGO 9, ILLINOIS

Circle 633 on postcard, page 33

Do-It-Yourself Custom Framing

Design applications of slotted angle ranging from racks, mezzanines, platforms and other structures to materials handling and packaging equipment are illustrated and described in 8-pp Bulletin AD-396. Acme Steel Co.

For a copy, circle 167 on Post Card

Storage Racks for Your Needs

Catalog 107A, 8 pp, gives sizes, capacities of "Ridg-U-Rak" upright frames and stringers for all material storage conditions. Bernard Gloekler North East Co.

For a copy, circle 168 on Post Card

HOSE, FITTINGS

Flexible Metal Hose

Catalog 600, 32-pp, is a selection guide telling how to rate hose working pressures so that corrections can be made for job conditions. Covers problems of non-steady pressures, elevated temperatures, choice of fittings. Atlantic Metal Hose Co.

For a copy, circle 169 on Post Card

Teflon-Core Hose Assemblies

Anaconda Type T4 hose and reusable fittings that can be made into assemblies with hand tools are described in Bulletin TC-46R, giving construction, properties, engineering data. Anaconda Metal Hose Div.

For a copy, circle 170 on Post Card

MACHINE SHOP

Light-Heavyweight Machine Tools

Comprehensive selection data and specifications on light-heavyweight machine tools and accessories are presented in 48-pp Catalog WT-50, Rev. 4. Among tools covered are drill presses, grinders, cut-off machines, band saws and belt and disc surfacers. Rockwell Mfg. Co.

For a copy, circle 171 on Post Card

Carbide Tool Ordering Guide

Carbide tipped tools, blanks, inserts and holders are featured in 36-pp Catalog 861. Includes price list, selection charts, dimensions, and data on grades stocked. Besly-Welles Corp.

For a copy, circle 172 on Post Card

Reader Service Cards for ordering bulletins are on pages 33 and 34.

Tools for Better Service

Performed carbide parts, standard blanks (rectangles, squares, diamonds, discs and center tips), and brazed tools in 200 sizes, styles, are listed in Catalog GC-61A, 32 pp. Includes details on preforms, charts on trouble shooting and Valenite grade characteristics. Valenite Metals Div., The Valeron Corp.

For a copy, circle 173 on Post Card

Cemented Carbide Products

Simplified Practice Recommendation R-263-60 issued by the U. S. Dept.

THE MOST COMPLETE LINE OF MECHANICAL PACKINGS* IS EASIEST TO GET FROM INDUSTRIAL DISTRIBUTORS EVERYWHERE

(See Thomas' Register and Conover-Mast Purchasing Dir.)

* HIGH PRESSURE ASBESTOS • ROTARY PUMP PACKINGS • VALVE PACKINGS • V-RINGS • LEATHER PACKINGS • SHEET PACKINGS AND GASKETS • HYDRAULIC & PNEUMATIC PACKINGS • METALLIC PACKINGS • PLASTIC PACKINGS • TEFLON PACKINGS & GASKETS • SPIRAL WOUND GASKETS

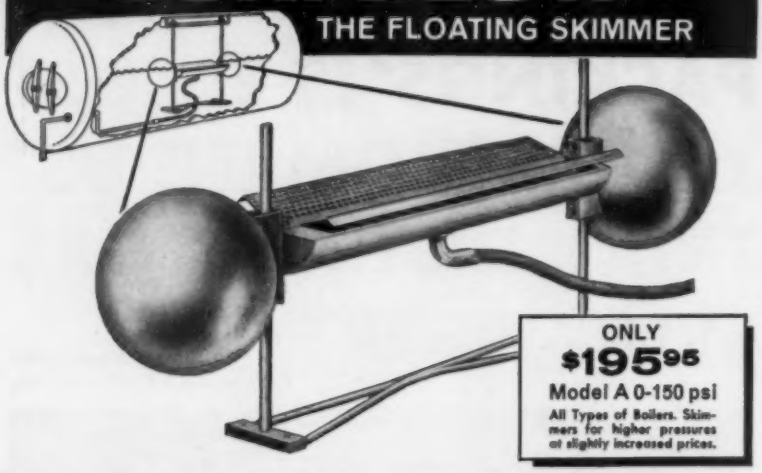
Better Buy

BELMONT

THE BELMONT PACKING & RUBBER COMPANY • PHILADELPHIA 37, PA.

Circle 634 on postcard, page 33

Boiler down-time cut 60% with
SURFBLOW
THE FLOATING SKIMMER



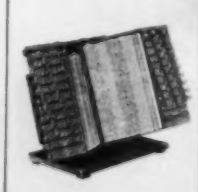
Tests and user reports prove SurfBlow Floating Skimmers cut down-time up to 60%—reduce blow-off over 50% for internally treated boilers—cut water treatment over 45% in many installations!

SurfBlow automatically skims off boiler water impurities from the critical steam release zone, whatever the turbulence or water level fluctuation. Simple to install. Made of maintenance-free stainless steel. Pays for itself in weeks—even days! Write now for complete information.

BOILER SPECIALTIES CORPORATION
78 Box 485, Gary, Indiana
Circle 635 on postcard, page 33

IT'S A SNAP
to keep life in FLEXOLINE lists without recopying

Snap out dead listings. Snap in new names in exactly the sequence you want. Type only fresh additions...in seconds...on scored sheets that separate into springy strips. Flexoline frames in hinged stands or rotaries hold thousands of strips for instantly visible reference. Perfect for listings of parts, phone information, cross files, account numbers, routing guides and hundreds of other active records. For more information, send the coupon now.



ACME VISIBLE
ACME VISIBLE RECORDS, INC.
3808 West Allview Drive, Crozet, Va.
Please give me full facts on time and money saving Flexoline reference systems.
NAME
ADDRESS
CITY ZONE STATE

Circle 636 on postcard, page 33

BULLETINS

(Begins on page 31)

of Commerce lists standard shapes, sizes, grades, and designations of cemented carbide products. Covers throw-away carbide inserts, saw tips, chisel blanks, die nibs, masonry drills, twist drill blanks, others. Cemented Carbide Producers Ass'n.

For a copy, circle 174 on Post Card

OTHER EQUIPMENT

Corrosion-Proof Materials

Complete line of corrosion-proof cements, flooring materials, interliners, coatings and rigid plastic fabrications are given in 16-pp Bulletin 1-1. Included are data on physical properties, construction, and products' resistance characteristics to 166 common corrosives. Atlas Mineral Products Co.

For a copy, circle 175 on Post Card

Fluid Power Cylinders

Design features and advantages of air and hydraulic power cylinders are detailed in 24-pp Bulletin P2546P. Selection tables are included for air cylinders, hydraulic cylinders, accumulators, hydraulically controlled air power units, boosters, and pipe thread fittings. Miller Fluid Power Div., Flick-Reedy Corp.

For a copy, circle 176 on Post Card

Any of these bulletins, catalogs and technical booklets can be yours without cost or obligation. Use the Reader Service Cards on page 34.

Protection for Compression Lines

Bulletin 118 tells how TR filters remove condensed moisture, oil and pipe scale from compressed air lines. Includes charts to guide in selection of sizes. R. P. Adams Co., Inc.

For a copy, circle 177 on Post Card

For Process Industries

Products for chemical processing industries are described in 12-pp Bulletin G-3E. Covers pumps, pneumatic conveyors, fluidizing conveyors, rotary compressors, vacuum pumps, horizontal grate coolers, suspension-type pre-heaters, positive displacement blowers and gas pumps, fans and exhausters. Fuller Co.

For a copy, circle 178 on Post Card

Shutdown Master Planner

This wall chart facilitates scheduling of equipment shutdown maintenance activities. Items involved in the shutdown are shown at a glance, and space is provided for listing time and manpower requirements. Westinghouse Electric Corp.

For a copy, circle 179 on Post Card

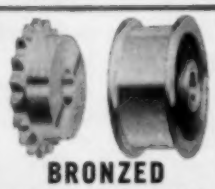
Compact Cooling Towers

Dimensional data and diagrams on single-cell and multi-cell cooling

Controlled tensioning eliminates shock loading through excessive chain vibration, and horsepower loss through belt slippage.

- ROTATING ARM ACTION FOR GREATER ADJUSTMENT
- FULL 360° POSITIONING

A low cost tensioner for single and multiple width drives that is more adaptable to machine frames. *See your Power Transmission Distributor* or write . . .



BRONZED BUSHED IDLERS
14 SIZES
AVAILABLE FROM STOCK

BREWER MACHINE & GEAR CO.
1441 N. 2nd St. St. Louis 6, Mo.

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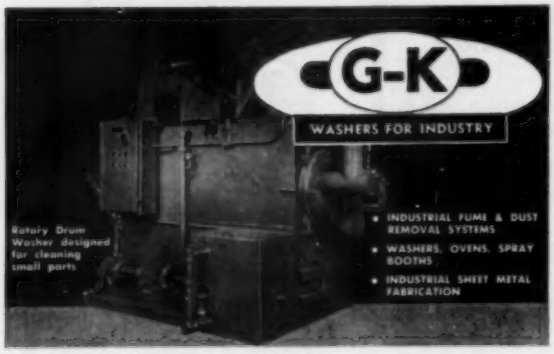
G-K
WASHERS FOR INDUSTRY
Rotary Drum Washer designed for cleaning small parts
• INDUSTRIAL FUME & DUST REMOVAL SYSTEMS
• WASHERS, OVENS, SPRAY BOOTHS
• INDUSTRIAL SHEET METAL FABRICATION

Designers, Builders and Installers of Washers to handle any industrial process, and built to the exact specifications determined by our complete engineering analysis of your job requirements.

Write for our complete General Catalog

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6195 Selkirk Ave., Detroit 11, Mich. • WAlnut 1-3088

Circle 638 on postcard, page 33

Easy-to-Move . . . Time-Saving Power for Your Shop or on the Job . . . New

RIDGID® 300 Power Drive

Bench, stand or truck mounted, this compact RIDGID 300 Power Drive quickly pays for itself in time and labor savings. Speed chuck closes and releases by hand . . . holds tight forward or reverse. Cam-action rear workholder holds even long lengths straight for perfect threads and cuts every time.

Converts to Low-Cost Threading Machine

Add the RIDGID No. 310 Carriage, No. 360 Cutter and a RIDGID Quick-Opening Machine Die Head, and you're ready to cut, thread and ream. With a No. 19 Nipple Chuck you even cut and thread close nipples with threading machine speed and ease.

DRIVES GEARED THREADERS • THREADS CLOSE NIPPLES

Call your Distributor today. For your convenience, he maintains a complete stock of RIDGID Work-Saver Pipe Tools and parts!

RIDGID
The Ridge Tool Company • Elyria, Ohio, U.S.A.

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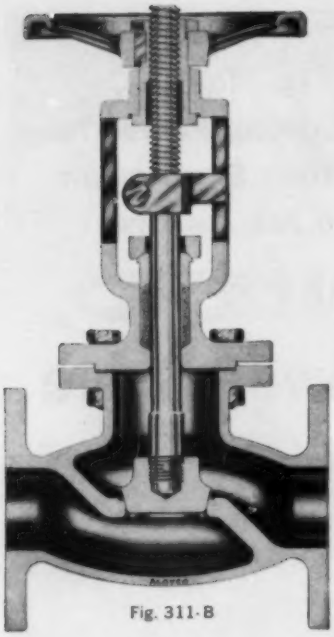


Fig. 311-B

7 ADVANTAGES OF THE NEW ALOYCO GLOBE VALVE DESIGN!

Redesign of sizes 2 inches and larger involves conversion from a rotating stem with rising handwheel and free floating disc to a non-rotating stem, non-rising handwheel with disc assembly pinned to the stem. Advantages include:

- No spiral wear pattern on stem from hardened packing or hard deposit in stuffing box.
- Rapid visual check of throttling control by observing location of stem stop.
- No galling of back seat because of rotating stem.
- No galling between seat and disc.
- Stronger disc to stem connection.
- No spinning of disc.
- Less corrosion attack because of elimination of cavity between stem and disc.

For more information on these Aloyco valves of Stainless Steel and other corrosion resistant alloys, write for Bulletin #7, Alloy Steel Products Company, Inc., 1308 West Elizabeth Avenue, Linden, New Jersey. 1.10

Subsidiary of

Longer Lasting ALOYCO VALVES

For the Corrosive Service

ALLOY STEEL PRODUCTS COMPANY

Circle 640 on postcard, page 33

BULLETINS

(Begins on page 31)

towers are presented in this 6-pp bulletin, along with specifications, performance data, pump head information. The Marley Co.

For a copy, circle 180 on Post Card

. . . OF SPECIAL INTEREST

Equipment Noise Control

Effective approaches to solving acoustical problems are outlined in 14-pp Publication 1-EA-910-A. Absorption of air-borne noise and reduction of structurally borne-sound are explained, test methods, performance tables, nomographs included. Owens-Corning Fiberglas Corp.

For a copy, circle 181 on Post Card

Roller Chain Applications

Presented in file folder are design ideas on efficient use of roller chain. Provides mechanical drawings showing roller chain used as slat conveyor, reciprocating drive, feed roll drive, chain roller bearing, external gears, internal gears, flexible shaft coupling, rack and pinion table feed, lever actuator, rod conveyor and others. Atlas Chain & Mfg. Co.

For a copy, circle 182 on Post Card

Steam Jet Blowers, Nozzles

Operation and performance of steam jet blowers using pressure steam or compressed air for ventilating and circulating applications, and blast nozzles designed for low drafts in ducts and stacks is described in Bulletin 4 AB, 8-pp. Dimensions, weights given. Schutte and Koerting Co.

For a copy, circle 183 on Post Card

Guide to Better Closures

Comparative data on methods for bottom closing regular slotted containers and other corrugated boxes is presented in 20-pp Bulletin AD-230. Covers machine and hand gluing, taping with kraft-backed and reinforced materials, stapling and stitching. Acme Steel Co.

For a copy, circle 184 on Post Card

Versatile Self-Sticking Tapes

Details on self-sticking tapes for use in design and layout applications where speed and accuracy are essential are presented in this illustrated 26-pp catalog. Covers printed tapes, templates and accessories for use in preparation of charts, graphs, slides, transparencies, plant layouts, floor plans, flow diagrams. ACS Tapes, Inc.

For a copy, circle 185 on Post Card

Adjustable Safety Positioner

Advantages of an adjustable safety positioner in eliminating accident potential and reducing power press down time are detailed in Bulletin AD-108. Duff-Norton Co.

For a copy, circle 186 on Post Card

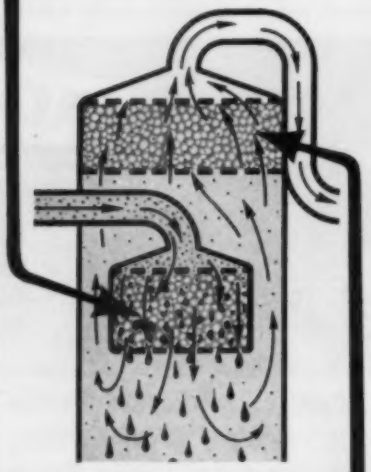
NEW! *King* COMPRESSED AIR FILTERS

20 to 200 scfm ¼" to 2" NPT

REMOVE ALL HARMFUL TRACES OF DIRT, WATER AND OIL— *Month after Month with NO MAINTENANCE!*

HERE'S HOW:

WET SCRUBBER CARTRIDGE causes mist and fog to form large drops that fall into sump. Takes out dirt, water and oil down to **less than 2 microns.** Self-cleaning; has **almost unlimited service life.**



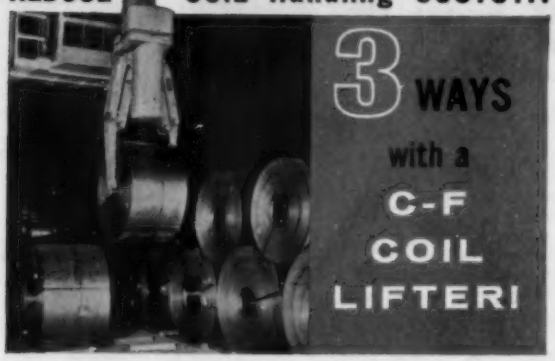
DRY POLISHER CARTRIDGE removes practically the last remaining traces of dirt, water and oil; **leaves the air exceptionally clean.** Scrubber cartridge does nearly all the work, so Polisher also has **almost unlimited service life.**

Get ALL the facts! Write today for free KING FILTER CATALOG.

KING ENGINEERING CORP.
3231 S. State St. Ann Arbor, Mich.
LIQUID LEVEL GAGES, MANOMETERS, ACCESSORIES—SINCE 1933

Circle 641 on postcard, page 33

REDUCE COIL Handling COSTS...



1 **SAVE MANPOWER**—only 1 man, the crane operator, is required to operate the C-F Coil Lifter above.

2 **SAVE SPACE**—you can operate a C-F Coil Lifter in a minimum of space, as little as 10" to 12", between piles, regardless of coil width.

3 **ELIMINATE DAMAGE**—the strong mechanical grip, and legs remaining vertical at all times prevent any damage to stock or material.

Motorized C-F Coil Lifters with Motorized Swivels as above are designed for safe, fast, efficient one man operation. They allow the crane operator to grab, lift, carry and rotate, set down and release the load precisely—in minimum space—without additional help.

WRITE NOW FOR NEW BULLETIN **SL 32.**

CULLEN-FRIESTEDT Co.

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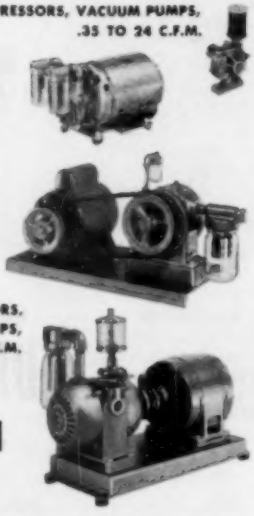
Circle 642 on postcard, page 33

OIL-LESS AIR COMPRESSORS, VACUUM PUMPS, .35 TO 24 C.F.M.

INTEGRAL-MOTOR AIR PUMPS .6 TO 3.8 C.F.M.

LIGHT-DUTY MODELS, .6 TO 24 C.F.M. V-BELT OR COUPLING

HEAVY-DUTY AIR COMPRESSORS, VACUUM PUMPS, 4 TO 50 C.F.M.



GAST
VACUUM PUMPS and AIR COMPRESSORS

Extra dependability for plant use . . . for O.E.M.

Need a source of low pressure air or moderate vacuum? Check with Gast! Save money, time, effort in choosing the best air pump for your job.

Precision quality and rotary design provide outstanding dependability. Vanes take up their own wear . . . maintaining like-new performance. Quiet, non-pulsating air . . . no tank needed! Oil-less or lubricated models—direct coupling, V-belt or integral-motor drives. Sizes from 1/40 to 5 h.p., .35 to 50 c.f.m. Vacuum to 28" Hg, pressure to 30 p.s.i.g.

WRITE TODAY FOR CATALOG! If you can, specify pump type you need.

AIR MOTORS • VACUUM PUMPS • COMPRESSORS

GAST MANUFACTURING CORP.

P. O. Box 117-U • Benton Harbor, Michigan

Circle 643 on postcard, page 33

THE HEART OF TROUBLE-FREE OPERATION

INDUSTRIAL COMBUSTION
HEV-E-OIL OR POWER GAS BURNERS

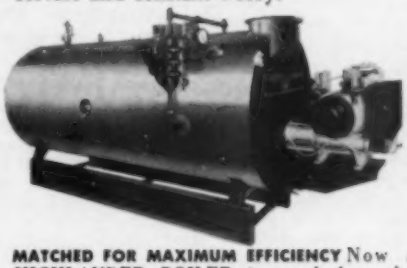
The heart of any boiler is the burner that fires it. Leading engineers, contractors and architects have found HEV-E-DUTY BURNERS prove dependable in institutional and commercial buildings where reliability is essential.

Beat competition in quality . . . reliability . . . ease of installation . . . cost of operation!

HEV-E-DUTY BURNERS start smoothly and safely with low-fire. Burner modulates from low to high fire for efficient combustion over complete fuel range.

Every HEV-E-DUTY BURNER is completely assembled, wired, tested and fired at the factory. Installation is quick, easy and money-saving. Install as replacements on existing boilers or new boiler installations. If you need engineering advice, count on us.

As the heart — HEV-E-DUTY BURNERS give you trouble-free operation day after day . . . without frequent service and constant worry.



Capacities from 720,000 to 21,000,000 BTU's. Meets all code standards; Underwriters' Laboratory approved.

Write HEV-E-DUTY BURNERS, Dept. G81 today for complete information.

MATCHED FOR MAXIMUM EFFICIENCY Now available, the HIGHLANDER BOILER is matched to the maximum performance of HEV-E-DUTY BURNERS. The perfect marriage of a boiler and burner unit eliminates the problem of trying to match a burner to any random boiler. To guarantee perfect operation the entire unit — both boiler and burner — is completely approved by Underwriters Laboratory with certified rating for output.

EASY FUEL CHANGE-OVER: Models available for gas or oil or combination gas/oil.

INDUSTRIAL COMBUSTION INC.

EXECUTIVE OFFICE:
4447 N. OAKLAND AVE.
MILWAUKEE 11, WIS.

Circle 644 on postcard, page 33

FITS ANY LIFT TRUCK DUMPS AUTOMATICALLY

CAN CUT HANDLING COSTS 50%

With this self-dumping hopper on your lift truck, one man can do the work of two—in a fraction of the usual time. It's the modern, low-cost way to handle scrap metal, small castings, cinders, punch press parts, hot forgings, cullet—all kinds of bulk material.

DUMPS ITSELF

Attaches in seconds to any lift truck—fork or platform. Can't slip off. Operator picks up loaded Hopper—transports it to its destination—releases the latch—and the Hopper automatically dumps its load, rights itself, locks itself.

RIGHTS ITSELF

LOCKS ITSELF

Roura Hoppers are sturdily made of 3/16" steel plate with continuous arc-welded seams. Heavier plate if desired, also stainless steel or galvanized. Made in eight sizes, 1/8 to 4 yard capacities, mounted on live skids or a choice of wheels. Standard models available for immediate shipment.

ROURA
Self-Dumping
HOPPER

WANT MORE DETAILS? Just clip this coupon to your letterhead and mail to
ROURA IRON WORKS, INC.
1413 Woodland Ave., Detroit 11, Michigan

Circle 645 on postcard, page 33

BULLETINS

(Begins on page 31)

Stationary, Portable Manifolds

Industrial manifolds, including 21 stationary models for use with oxygen, acetylene, argon, nitrogen, hydrogen and other gases, are described in Form 55-086. Units range from automatic change-overs that accomodate unlimited cylinders to ready-to-install manual change-overs. Linde Co., Div. of Union Carbide Corp.

For a copy, circle 187 on Post Card

Inverted-Y Electrification

Aluminum inverted-Y conductor systems discussed in Form 2025A, 8-pp, are available for 500-1200 amp, continuous rating, 600-v for wall and ceiling mounting in dry places. Advantages listed. The Cleveland Crane & Engineering Co.

For a copy, circle 188 on Post Card

Steel Strapping Tool

Model A4 Pneumatic Steelstrapper, an air-driven hand tool, for paper, metals, building products and other industries is illustrated and described in 8-pp Form AD-251. Techniques, applications, and accessories included. Acme Steel Co.

For a copy, circle 189 on Post Card

Processing Equipment Guide

Illustrated Bulletin 7004, 16-pp, describes units for handling of agitation, classification, sedimentation, centrifuging, filtration, pumping, fluidization and ion-exchange. Applications included. Dorr-Oliver, Inc.

For a copy, circle 190 on Post Card

Airless Blast Machines

Features and advantages of the Super Tumblast, a batch-type airless abrasive blast cleaning machine are detailed in 28-pp Catalog 162-D. Specifications and details on replacement cost analysis. Wheelabrator Corp.

For a copy, circle 191 on Post Card

Power Lube Systems

Centralized lubrication equipment is featured in Catalog 82, 32-pp. Automatic, semi-automatic and manual equipment, high and low pressure injectors, timing and alarm controls, filler pumps are detailed. Lincoln Engineering Co.

For a copy, circle 192 on Post Card

Heavy Oil Burners

Oil burners engineered to use low-cost, high-heat content heavy fuel oils are illustrated and described in 8-pp Bulletin 1. Advantages and applications. Industrial Combustion Inc.

For a copy, circle 193 on Post Card

Decimal Equivalents Chart

At-a-glance reference data on decimal equivalents for steel tubing—conversion of Birmingham wire gages and fractions to decimals—is available with this wall chart. Ohio Seamless Tube Div., Copperweld Steel Co.

For a copy, circle 194 on Post Card

NEW ARMSTRONG CATALOG

Quality Tools for Industry

New ARMSTRONG General Catalog No. 700, showing the complete ARMSTRONG Line including approximately 330 new ARMSTRONG tools added in these categories:

- Tool Holders
- Set-Up-and-Hold-Down Tools
- Tool Bits
- Wrenches
- Ratchet Wrenches and Sockets
- Miscellaneous Hand Tools
- Pipe Tools

Anyone who uses or buys hand tools or shop tools needs this free ARMSTRONG Catalog No. 700 showing these important additions as well as thousands of other ARMSTRONG tools. Write direct, or phone your local ARMSTRONG Distributor (Distributor name furnished upon request).

Armstrong Bros. Tool Co.
5207 W. Armstrong Ave. • Chicago 46, Illinois

Circle 646 on postcard, page 33

INTRODUCING THE NEW

DRYDEN-EAST HOTEL

39th St., East of Lexington Ave.

NEW YORK

Salon-size rooms • Terraces • New appointments, newly decorated • New 21" color TV • FM radio • New controlled air conditioning • New extension phones in bathroom • New private cocktail bar • Choice East Side, midtown area • A new concept of service. Prompt, pleasant, unobtrusive.

Single $15 to $22 Suites to $60
Special rates by the month or lease

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The 42 LB.
GRIPHOIST
TIRFOR

LIFTS • PULLS LOWERS 3300 LBS.
Single Line

Capacity increased to 6 TONS with pulley blocks

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Replaces chain hoists, air hoists, winches . . less cost, less maintenance. Unlimited cable travel, portable, hand operated . . faster, cuts rigging time . . unmatched safety record.

One Year Guarantee

Preferred on job after job, in construction, refineries, oil drilling, plant erection and maintenance, mining, machinery moving, trucking, etc.

See your local dealer

GRIPHOIST, INC.
744 Harrison St., San Francisco 7, Calif.
334 Granite Ave., Boston (Milton 86), Mass.

½" wire rope

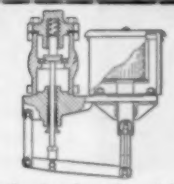
3,300 LBS.

Circle 648 on postcard, page 33

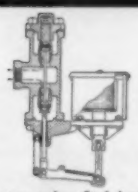
BIG LINE-UP
BIG PERFORMANCE

Johnson Solenoid Valves are built for heavy duty service . . . handling, air, water, steam, heavy viscous liquids. No pilots or pistons; powerful leverage design opens smaller valves against 250 lbs. Because of the remoteness of the solenoid, temperatures up to 400° F. are easily handled without adverse effect on the solenoid coil. Bodies are bolted together. Explosion-proof models also.

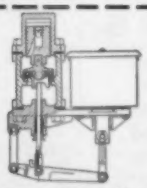
JOHNSON
Direct Operated
SOLENOID VALVES



Normally closed service, stainless steel valve and seat. Sizes ⅜"-3". Also for normally open service, and with Jenkins Disc.



3-way valve. Stainless steel valves and seats. Sizes ½"-1½".



Dashpot construction, cushions closing to avoid water hammer. Jenkins Disc. Sizes ¾"-2".

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by J.R.WILLIAMS
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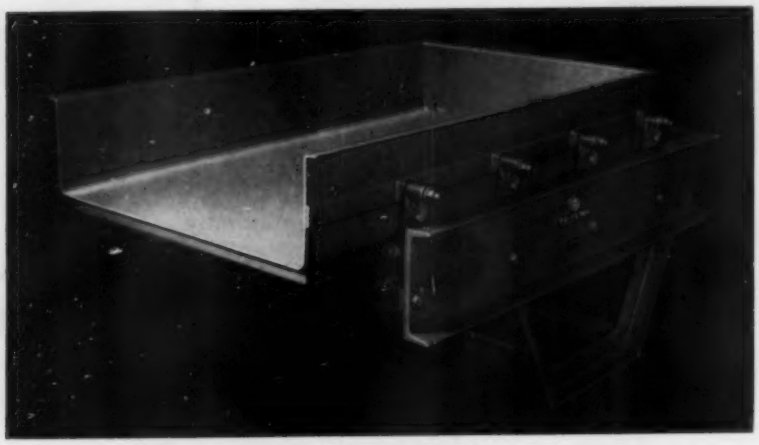

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NEW BOOKS

for the plant engineer

On Tool Steel

TOOL STEEL SIMPLIFIED by F. R. Palmer and G. V. Luerssen. Size 9¼ by 6¼ in.; 585 pp; third edition; illustrated; clothbound. Published by the Carpenter Steel Co., Reading, Pennsylvania. Price $2.50 in U.S.A.

THE FIRST edition of this book was published nearly 25 years ago. The current edition incorporates revisions and also includes new material.

Tool steels are treated extensively in this informative book in which the material is presented in four principal sections. Pages in these divisions are marked at the edges to help guide the reader.

Part 1 is an acquaintance section dealing with terms, analysis, character, soundness, and identity of tool steel.

In the second part, selection of steel is treated. The matched set approach is discussed. Many pages are taken by a "selector" in which the publisher's product names appear.

Part 3 goes into properties, treatment and testing of tool steel. This section includes discussions on high-speed steel, hot-work steels, and air-hardening steels.

Among the subjects commented upon in the final part are: relation of design to heat treatment, spark testing, furnace atmosphere, and quenching and tempering.

Management Series

MANAGEMENT GUIDES by B. T. Lewis and Wm. W. Pearson; size 8½ by 6½ in.; paperbound. Published by John F. Rider Publisher, Inc., 116 W. 14th St., New York 11, N.Y.

Management Guide for Maintenance Supervisors—No. 275-1; over 50 pp; price $1.25. In this practical book such items as preventive maintenance practices, problem solving in maintenance management, supervision of the maintenance function, maintenance work measurement, and cost reduction procedures are discussed. It includes a glossary of terms, a collection of sample forms, and a list of references.

Management Guide for Production Control—No. 275-2; 63 pp; price $1.40. The second volume in the series deals with functions and procedures relating to production and inventory control, applications of mathematical techniques to scheduling and inventory

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NEW BOOKS

control, and applications of electronic data processing and punch card systems to both production and inventory control. It, too, contains a glossary of terms and a reference list.

Management Guide for Preventive Maintenance—No. 275-3; 58 pp; price $1.25. This volume offers some guidance for the institution of a preventive maintenance program. It goes into the organizational considerations for such a program. This book also deals with systems and procedures, records, work measurement, supervision includes comments on mathematical techniques. This guide also has a glossary and a reference listing.

Management Guide to Applied Industrial Psychology—No. 275-4; over 65 pp; price $1.50. Among the items discussed in this guide are: social status, motivation and incentives, use of tests for supervisory selection, human relations concepts, supervisors as counselors, managing stress, and process of communication. One of the appendix sections contains the names of several tests and information as to what they measure. Reprinted matter on an industrial plan of employee counseling is presented in another section of the guide.

Instrumentation and Controls

HANDBOOK OF INSTRUMENTATION AND CONTROLS by H. P. Kallen. Size 9¼ by 7½ in. approx.; 692 pp; illustrated; clothbound, Published by McGraw-Hill Book Company, Inc., 330 West 42nd St., New York 36, N. Y. Price $15.00.

A PRACTICAL MANUAL covering instruments and controls extensively. Its discussions relate to the following areas of application: heating systems, air-conditioning systems, ventilating systems, steam and power plants, refrigeration, diesel plants, and water treatment. The book should helpfully fit the needs of those who design, specify and procure equipment.

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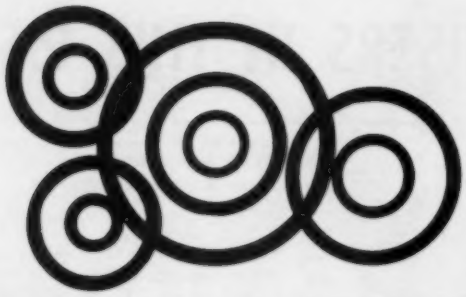

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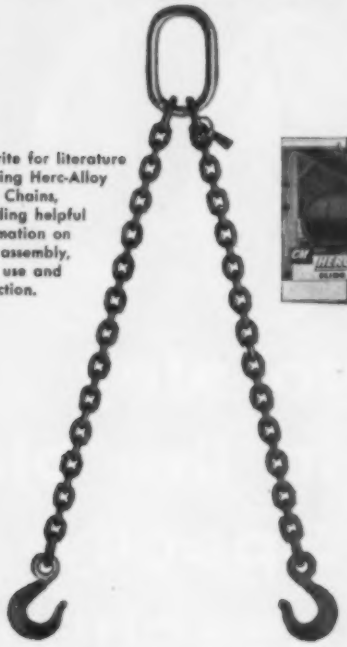

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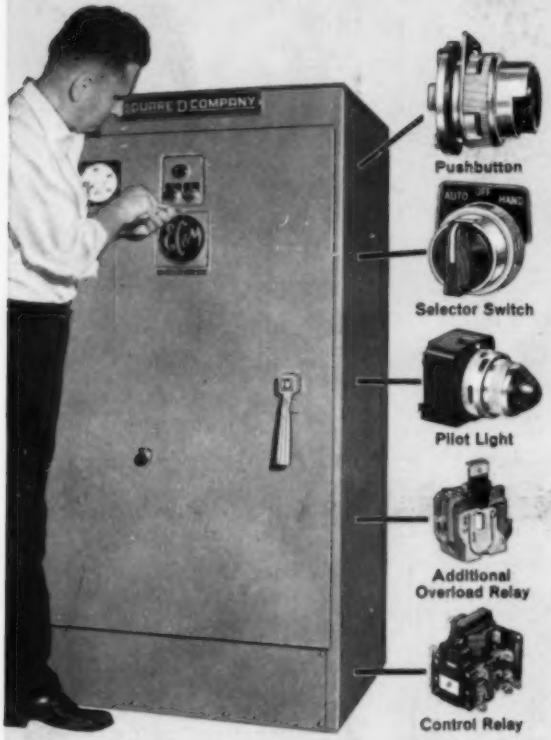
FAST DELIVERY of SIZE 6, 7 & 8 STARTERS



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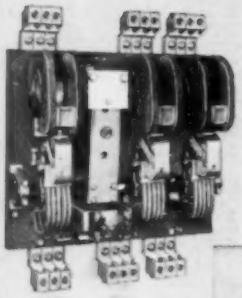
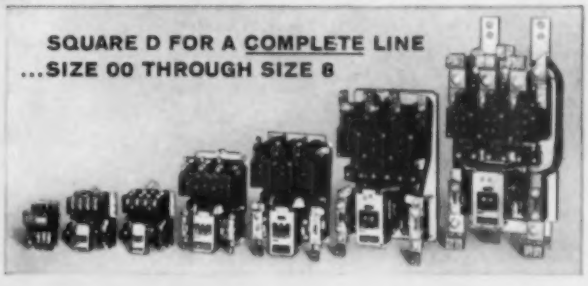


• With Square D Size 6, 7 and 8 starters, you get DC-operated (self-contained DC supply) mill-type contactors—at no extra cost. Exclusive Line-Arc construction dissipates heat, provides longer contact life. Self-lubricating bearings plus simple design make maintenance extremely easy. Another standard feature is lugs which accommodate either copper or aluminum cable.

• The magnetic starters shown at right—which range from Size 00 through Size 5—plus the Size 6, 7 and 8 starters described above, add up to a *complete* Square D line for *any* AC motor application.



Write for Bulletin 8536. Square D Company, EC&M Division, 4500 Lee Road, Cleveland 28, Ohio

SQUARE D COMPANY

EC&M DIVISION • CLEVELAND 28, OHIO

wherever electricity is distributed and controlled

5291

Circle 663 on postcard, page 33

BEST BUY FOR AIR SUPPLY

UP TO 5hp... NEW WORTHINGTON MONOBLOC X-COMPRESSOR

Based on purchase price, on extremely long compressor life . . . and on safety, too . . . your best buy for a 1½- to 5-h.p. air supply is the new Worthington MONOBLOC X-Compressor.

First, the MONOBLOC saves you $30 or more for parts and labor because it comes completely wired. There's no starting switch to buy and install and wire in.

It's more economical, too, because all your money goes to buying a quality motor, compressor, controls and tank. You don't waste it on unnecessary belts, belt-guard, sheaves, long base and on the labor required for assembling them.

Is floor space important to you? The MONOBLOC vertical tanks save over 60% of space required by old-style horizontal units. A 10" radius circle for the 60-gal. tank; a 12" radius circle for the 80-gal. tank.

The MONOBLOC costs less to run. All power goes to the compressor—no power loss in belt friction. (No belt guards or belt replacements.)

Of course, you want long compressor life. The MONOBLOC is built with the new Worthington X-Compressor design that virtually eliminates harmful vibration. The wide-stance X-shape design reduces vibration to the point where a coin can be balanced on the unit during starting, running and stopping.

A silicon-treated filter element removes over 99% of the dirt from incoming air—the most dangerous source of compressor wear. Tapered roller bearings cut friction. The large lubricating oil sump permits better cooling, less danger from low oil supply. These and other design features assure extremely long compressor life.

We and our distributors are ready and happy to show you why there's no better way of buying cheap air today. Call the Worthington Distributor listed in your Yellow Pages. Worthington Corporation, Section 34-8, Holyoke, Massachusetts.

WORTHINGTON

PRODUCTS THAT WORK FOR YOUR PROFIT

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